Curriculum Book

and

Assessment and Evaluation Scheme

based on

Outcome Based Education (OBE)

and

Choice – Based Credit System (CBCS)

in

Bachelor in Computer Application (Honours)
B.C.A. (Hons.)

4 Year Degree Program

Revised as on 01 August 2023
Applicable w.e.f. Academic Session 2023-24

AKS University
Satna 485001, Madhya Pradesh, India

Faculty of Computer Applications & Information Technology and Sciences
Department of Computer Application & Information Technology

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A K S University, Satna

Faculty of Computer Applications & Information Technology and Sciences

Department of Computer Application & Information Technology

Curriculum & Syllabus of BCA (Bachelor of Computer Applications)

(Revised as of 01 August 2023)

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A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

Curriculum of BCA (Bachelor of Computer Application)

(Revised as on 01 August 2023)

Foreword

I am thrilled to observe the updated curriculum of the Computer Application & Information Technology Department for the BCA (Bachelor of Computer Applications)

Program, which seamlessly integrates the most recent technological advancements and adheres to the guidelines set forth by UGC. The revised curriculum also thoughtfully incorporates the directives of NEP-2020 and the Sustainable Development Goals.

The alignment of course outcomes (COs), Programme Outcomes (POs), and Programme Specific Outcomes (PSOs) has been intricately executed, aligning perfectly with the requisites of NEP-2020 and NAAC standards. I hold the belief that this revised syllabus will significantly enhance the skills and employability of our students.

With immense satisfaction, I hereby present the revised curriculum for the B.Sc. IT (Bachelor of Science in Information Technology) program for implementation in the upcoming session.

Er. Anant Soni

Pro Chancellor and Chairman

01 August 2023

AKS University, Satna

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application& Information Technology

BCA (Bachelor of Computer Applications)

From the Desk of the Vice-Chancellor

AKS University is currently undergoing a process to revamp its curriculum into an outcome-based approach, to enhance the teaching and learning process. The foundation of quality of quality education lies in the implementation of a curriculum that aligns with both societal and industrial needs, focusing on relevant outcomes. This entails dedicated and inspired faculty members, as well as impactful industry internships. Hence, it is of utmost importance to begin this endeavor by crafting an outcome-based curriculum in collaboration with academia and industry experts. This curriculum design should be informed by the latest technological advancements, market demands, the guidelines outlined in the National Education Policy (NEP) of 2020, and sustainable goals.

I'm delighted to learn that the revised curriculum has been meticulously crafted by the Computer Application & Information Technology Department, in consultation with an array of experts from the Computer Science industry, research institutes, and academia. This curriculum effectively integrates the principles outlined in the NEP-2020 guidelines, as well as sustainable goals. It also adeptly incorporates the latest advancements in Computer Science manufacturing technology.

Furthermore, the curriculum takes into account the specific needs of the Indian Computer Science industry, focusing on the production of cost-effective, high-quality Computer Science. It extends its reach to optimizing power consumption by including insights on waste heat recovery systems utilized in Computer Science plants. This inclusion not only imparts knowledge but also encourages students' independent thinking for potential enhancements in this area.

The curriculum goes beyond theoretical learning and embraces practical applications by incorporating the utilization of industrial and domestic waste in Computer Science production. To enhance students' skills, the curriculum integrates Hands-On Training, industrial visits, on-the-job training experiences, research, and progress. This well-rounded approach ensures that students receive a comprehensive education, fostering their skill development and preparing them for success in the Computer Science industry.

I am confident that the updated curriculum for Computer Application & Information Technology will not only enhance students' technical skills but also contribute significantly to their employability. During the process of revising the curriculum, I am pleased to observe that the Computer Application & Information Technology department has diligently adhered to the guidelines provided by the UGC. Additionally, they have maintained a total credit requirement of 120 for the BCA program.

It's worth noting that curriculum revision is an ongoing and dynamic process, designed to address the continuous evolution of technological advancements and both local and global concerns. This ensures that the curriculum remains responsive and attuned to the changing landscape of education and industry. AKS University warmly invites input and suggestions from industry expert technocrats and Alumni students to enhance the curriculum and make it more student-centered. Your valuable insights will greatly contribute to shaping an education that best serves the needs and aspirations of our students.

AKS University, Satna ***Professor B. A. Chopade***

01 August 2023 *Vice-Chancellor*

Preface

As part of our commitment to ongoing enhancement, the Department of Computer Application & Information Technology consistently reviews and updates its BCA program curriculum every three years. Through this process, we ensure that the curriculum remains aligned with the latest technological advancements, as well as local and global industrial and social demands.

During this procedure, the existing curriculum for the BCA Program undergoes evaluation by a panel of technocrats, industry specialists, and academics. Following meticulous scrutiny, the revised curriculum has been formulated and is set to be implemented starting from August 01, 2023. This implementation is contingent upon the endorsement of the curriculum by the University's Board of Studies and Governing Body.

This curriculum closely adheres to the UGC model syllabus distributed in 2020. It seamlessly integrates the guidelines set forth by the Ministry of Higher Education, Government of India, through NEP-2020, as well as the principles of Sustainable Development Goals. To foster the holistic skill development of students, a range of practical activities, including Hands-On Training, Industrial Visits, Project planning and execution, Report Writing, Seminars, and Industrial on-the-job training, have been incorporated. Furthermore, in alignment with AICTE's directives, the total credit allocation for the BCA program is capped at 120 credits.

To ensure a comprehensive learning experience, detailed evaluation schemes and rubrics have also been meticulously provided.

For each course, a thorough mapping of Course Outcomes, Program Outcomes, and Programme Specific Outcomes has been undertaken. As the course syllabus is meticulously developed, various elements such as session outcomes, laboratory instruction, classroom instruction, self-learning activities, assignments, and mini-projects are meticulously outlined.

We hold the belief that this dynamic curriculum will undoubtedly enhance the independent thinking, skills, and overall employability of the students.

Professor Akhilesh A. Waoo
Associate Dean and Head CS/IT

Introduction

AKS University proudly stands as a pioneer, being the first in the nation to introduce a comprehensive 3-year *Bachelor of Computer Applications (BCA)* program back in 2012. This innovative curriculum has been meticulously crafted to align with the dynamic needs of the computer and information industry and the most current technological advancements. Currently, a vibrant community of 170 students is actively engaged in pursuing their BCA within this department. The Faculty of Computer Applications & Information Technology and Sciences boasts cutting-edge laboratories that serve as hubs for immersive hands-on training, enabling students to delve into practical applications of their learning. The program incorporates both in house training and sandwich apprenticeship training, vital components that enrich the educational journey. Distinguished by a faculty composed of computer industry experts who bring with them a wealth of industrial experience, the department combines robust classroom instruction with practical and industrial acumen. This unique blend empowers our students to confidently contribute to software development and make a significant impact in the field.

Vision

To emerge as power house of information Technology and Allied areas developing competent computer professionals to meet the dynamic needs of disruptive technologies.

Mission

M01: To impart technical knowledge through innovative teaching, research and consultancy

MO2: Provides state-of-the-art facilities and internationally recognized faculty.

MO3: To adapt to the dynamic needs of industries through curriculum update

MO4: Promotes partnerships with industry and community and electrical energy in cement manufacture and environmental needs.

MO5: To produce competent graduates with professional ethics and life skills.

Program Educational Objectives (PEO)

PEO01: To develop technical and managerial skills among the students with practical knowledge to work in cement manufacturing unit and able to handle day to day plant problems.

PEO02: To develop R&D temperament among the students for development, innovation and sustainable technology in cement manufacturing process.

POE03: To develop ethical principles among the students and commitment to

fulfilling international, national and local needs and social responsibilities with his/her professional excellence.

PEO04: Ability to understand the impact of professional engineering solutions in societal, economic and environmental contexts and demonstrate knowledge and need for sustainable development

Program Outcomes (POs)

PO1: Computational information: Appreciate and apply mathematical organization, computing and domain information for the conceptualization of computing models from clear harms.

PO2: Difficulty Analysis: Talent to classify, significantly evaluate and prepare complex computing problems using fundamentals of computer knowledge and request domains.

PO3: Drawing / Improvement of Solutions: Facility to transform composite production scenarios and present-day issues into problems, explore, recognize and propose included solutions using rising technologies.

PO4: Accomplish Investigations of Compound Computing Troubles: Ability to invent and ways experiments interpret data and present well up to date conclusions.

PO5: Current Implement Procedure: Skill to select recent computing tools, skills and techniques compulsory for original software solutions

PO6: Proficient Principles: Facility to apply and give expert principles and cyber systems in a universal monetary situation.

PO7: Ultimate Education: Identify the need for and enlarge the ability to appoint in permanent education as a Computing qualified.

PO8: Mission Administration: Skill to recognize administration and computing philosophy with computing acquaintance to supervise projects in multidisciplinary environments.

PO9: Announcement Usefulness: Converse successfully with the computing society as well as culture by being able to know successful documentations and presentations.

PO10: Public & Ecological Alarm: Ability to make out cost-effective, green, public, fitness, authorized, moral issues concerned in the use of processor expertise and other significant tasks applicable to qualified observers.

PO11: Personality & Group Job: Ability to job as a part or manager in various teams in multidisciplinary situations.

PO12: Modernization and Private Enterprise: Classify opportunities, private enterprise dream and use of original thoughts to build worth and means for the betterment of the human being and the world.

Program Specific Outcomes (PSOs)

On completion of BCA program, the students will achieve the following program specific outcomes:-

PSO1: An ability to enhance the application of knowledge of theory subjects in diverse fields.

PSO2: Develop language proficiency to handle corporate communication demands.

PSO3: Preparing students in various disciplines of technologies such as computer applications, computer networking, software engineering, JAVA, database concepts and programming.

PSO4: In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced.

Mapping of PEOs with Mission of the Department

PEO	M1	M2	M3	M4
PEO1	3	2	3	2
PEO2	2	2	2	3
PEO3	2	3	2	1
PEO4	2	2	3	3

1*: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) "-": No correlation*

General Course Structure & Scheme

1. Definition of Credit

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

2. Range of Credits:

In the light of the fact that a typical Model three-year Under Graduate degree program in computer application has about 160 credits, the total number of credits proposed for the three-year Bachelor of Science in Information Technology is kept as 160 considering NEP-20 and NAAC guidelines.

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application& Information Technology

BCA (Bachelor of Computer Applications)

General Course Structure and Credit Distribution Scheme

Semester I						
3-Week Orientation Programme						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	0SDG01	Sustainable Development Goals	2	0	0	2
2.	0EVS03	Environmental Education	2	0	0	2
3.	01CA112	Computer Fundamentals, Organization and Architecture	3	1	2	6
4.	02CA121	Programming in C Language	3	1	2	6
5.	03MS173	Discrete Mathematics	4	0	0	4
	Total		**14**	**2**	**4**	**20**

Semester II						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	OSSD02	English Communication	2	0	0	2
2.	0IKS04	Indian Knowledge System	2	0	0	2
3.	01CA211	Programming methodology and data structure	3	1	2	6
4.	03MS231	Numerical Methods	4	0	0	4
5.	02CA221	Operating System	3	1	2	6
	Total		**14**	**2**	**4**	**20**

Semester III						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	0CA301	Data analytics and visualization through spreadsheet	2	0	0	2
2.	0CA302	DTP	2	0	0	2
3.	01CA311	Programming with C#	3	1	2	6
4.	02CA321	Internet of things	3	1	2	6
	Choose any one (Open Elective)					
5.	03CA331	Data Communication and Computer Network	4	0	0	4
	03CA332	Optimization Techniques				
	Total		**14**	**2**	**4**	**20**

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Semester IV						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	0EN401	Entrepreneurship Development	2	0	0	2
2.		Minor Project	2	0	0	2
3.	02CA421	Internet Applications Using Java Programming	3	1	2	6
4.	01CA411	Database management System using PL/SQL	3	1	2	6
	Choose any one (Open Elective)					
5.	03CA431	E-Commerce	4	0	0	4
	03CA432	Computer Maintenance and Troubleshooting				
	Total		**14**	**2**	**4**	**20**

Semester V						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	01CA511	Python Programming	4	0	2	6
2.	0CA504	Cyber security	4	0	0	4
	Choose any one (DS Elective-1)					
3.	05CA521-A	Multimedia and animation	4	0	0	4
	05CA521-B	Design analysis of algorithms				
4.	06CA551	Field Project/Internship/Seminar/Workshop	0	0	6	6
	Total		**12**	**0**	**8**	**20**

Semester VI						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	01CA611	Web Technology	4	0	2	6
	Choose any one (DS Elective-2)					
2.	05CA621-A	AI and Data Science	4	0	0	4
	05CA621-B	Data Warehouse and Mining				
	Choose any one (DS Elective-3)					
3.	05CA622-A	Computer Graphics	4	0	0	4
	05CA622-B	Cloud Computing				
4.	06CA651	Field Project/Internship/Seminar/Workshop	0	0	6	6
	Total		**12**	**0**	**8**	**20**

Semester VII						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	06RM701	Research Methodology	4	0	0	4
2.	01CA711	Current Trends & Technology	3	1	2	6
	Choose any one (DS Elective-4)					
3.	05CA721-A	Theory of Computation	4	0	0	4
	05CA721-B	Compiler Design				
4.	06CA751	Field Project/Internship/Seminar/Workshop	0	0	6	6
	Total		**11**	**1**	**8**	**20**

Semester VIII						
S. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1.	06RM801	English for Research Writing	4	0	0	4
2.	01CA811	Statistical Thinking for Data Science	3	1	2	6
3.	06CA851	Research Project/Thesis Submission	0	0	10	10
	Total		**7**	**1**	**12**	**20**

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-I

Course Code: 0SDG01

Course Title: **Sustainable Development Goals (SDGs)**

Pre-requisite: Student should have basic knowledge of Environment, Natural resources, Climate change and sustainability.

Rationale: To inculcate the knowledge base on sustainable development with a view to balance our economic, environmental and social needs, allowing prosperity for now and future generations. To train students to undertake major initiatives in the efficient management of natural resources and the prevention of environmental pollution with focus on Sustainable Development.
To use environmental management tools that help to improve the quality of environment, to assess local vulnerabilities with respect to climate, natural disasters and to achieve sustainable developmental needs.

Course Outcomes:

0SDG01**.1:** Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.
0SDG01**.2:** Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.
0SDG01**.3:** Understand the implications of overuse of resources, population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.
0SDG01**.4:** Develop skills to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development and apply critical thinking skills to evaluate the quality, credibility and limitations of an argument for solution.
0SDG01**.5:** Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational Programmes and processes.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Foundation	0SDG01	Sustainable Development Goal	2	0	1	1	4	2

Legend: **CI:** Class room Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Foundation	0SDG01	Sustainable Development Goal	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

0SDG01**.1:** Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	**8**

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand about Sustainable Development **SO1.2** Understand the Need and Importance of SDGs **SO1.3** Understand the historical evolution of SDGs **SO1.4** Gain knowledge of SDGs Different goals and their importance **SO1.**5 Explain the Challenges & strategies of attaining SDGs in countries.		**Unit-1.0 Introduction to Sustainable Development** 1.1 Need and Importance of Sustainable Development 1.2 Historical & Policy perspectives of Sustainable Development 1.3 Sustainable Development: World and India Perspective 1.4 Introduction to 17 SDGs 1.5 Specific learning objectives for different SDGs 1.6 Challenges & strategies of attaining SDGs in developed and developing nations	Different SDG goals details and its importance

SW-1 Suggested Sessional Work (SW):

a. Assignments:
Overview of SDGs, Sustainable Consumption and Production, Details of 17 SDGs

b. Other Activities (Specify):
Note down the different challenges in our state and district to achieve SDG.

0SDG01**.2:** Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability and measuring.

Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Explain Sustainable Development **SO2.2** Understand the NEP-2020 and SDG **SO2.3** Discuss higher Education role to achieve SDGs **SO2.4** Explain how education for Sustainable Development **SO2.**5 Explain the measuring techniques for Sustainability .		**Unit-2.0** Special focus on SDG 4-Quality Education and Lifelong Learning 2.1 Focus of NEP-2020 on SDG 2.2 Education for Sustainable Development (ESD): 2.3 Berlin Declaration 2021 on ESD 2.4 Integration of ESD in curriculum and textbooks 2.5 Tools, Systems, and Innovation for Sustainability 2.6 Measuring Sustainability: How do we measure sustainability	1 NEP2020 objectives and concept for SDGs 2 Concept ,Tools and techniques for measuring sustainability

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
Education role to achieve SDGs, the role of education in Sustainable Development, Measuring techniques of sustainability, Sustainability Indicators

b. **Other Activities (Specify):** Seminar and group discussion on ESD and measuring sustainability Millennium Development Goals (MDGs)

0SDG01**.3:** Understand the implications of overuse of resources, population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.

Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand current economic issues in the context of the global sustainable development debate. **SO3.2** Outline of health, hygiene and water sanitation issues. **SO3.3** Discuss the renewable energy resources and its importance in present scenario **SO3.4** Explain the importance of sustainable production and consumption **SO3.**5 Explain the problems and solution in rural and urban areas.		**Unit-3.0 Understanding the SDGs** 3.1 Circular economy (basic model of reuse, recycle, and reduce) 3.2 Rural & urban Problems & Challenges 3.3 Sustainable production and consumption 3.4 Renewable energy 3.5 Health & Hygiene, water , sanitation & water management 3.6 Waste Management	1. Water Treatment and management practices. 2. Non-Renewabl eenergy resources.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
Ecofriendly energy resources importance, types of waste and its management, Urban Problems & Challenges

b. Other Activities (Specify):
Visit of waste water treatment plant, Visit of water treatment process.

0SDG01**.4:** Develop skills to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development and apply critical thinking skills to evaluate the quality, credibility and limitations of an argument for solution.

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Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Understand environmental sustainability is crucial in reducing the impacts of climate change **SO4.2** Discuss causes of emission of GHGs and its consequences **SO4.3** Explain how climate change and sustainable development both play a role in shaping the human and environmental factors of the world. **SO4.4** Explain the importance of sustainable production and consumption **SO4.**5 Climate change is disrupting national economies and affecting lives and livelihoods, especially for the most vulnerable and its mitigation.		**Unit-4.0 Climate Change, Energy and Sustainable Development** 4.1 The greenhouse effect: Causes and Consequences 4.2 Climate Change: A Threat to Sustainable Development 4.3 Adaptation to Current and Future Climate Regimes 4.4 The consequences: crop failure 4.5 Solutions technology and lifestyle changes 4.6 Mitigating Climate Change	**1** Agreement on Climate Change, Trade, and Sustainability Carbon Credit, carbon trading 2.Kyoto Protocol

SW-1 Suggested Sessional Work (SW):

a. Assignments:

Urban Sustainability and Climate Change, Sustainable Development Policies, Agreement on Climate Change, Trade and Sustainability, Resilient cities – What makes a city sustainable, green, and resilient

b. Other Activities (Specify):

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0SDG01**.5:** Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational programme and processes.

Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand the relevance and the concept of sustainability and the global initiatives in this direction **SO4.2** Understand role of Corporations and Ecological Sustainability**.** **SO4.3** Explain role of CSR in Sustainability. **SO4.4** Understand the SD challenge for companies, their responsibility and their potentials for action **SO4.5** Discuss the role of world government for world justice and peace		**Unit-5.0 Sustainable Business Practices:** 5.1 Corporate Social Responsibility 5.2 Sustainable products and services 5.3 Business and Environment 5.4 Corporations and Ecological Sustainability 5.5 Life Cycle Assessment: • LCA Overview and Application 5.6 World peace and justice: • United nations goals for peace and justice • World Government for peace	Local to the Global: Can Sustainable Development Work

SW-1 Suggested Sessional Work (SW):

a. Assignments:
Consumption Patterns and Lifestyles, Company Perspectives for Environmental Sustainability, an Introduction to Economic Growth

b. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (SI)	Total hour (Cl+SW+Sl)
0SDG01**.1:** Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.	6	1	1	8
0SDG01**.2:** Identify and apply methods for assessingthe achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.	6	1	1	8
0SDG01**.3:** Understand the implications of overuse of resources, population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.	6	1	1	8
0SDG01**.4:** Develop skills to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable developmentand apply critical thinking skills to evaluate the quality, credibility and limitations of an argument for solution.	6	1	1	8
0SDG01**.5:** Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational Programmes and processes.	6	1	1	8
Total Hours	30	5	5	40

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Need and Importance of Sustainable Development	03	01	01	05
CO-2	Education for Sustainable Development (ESD): Tools, Systems, and Innovation for Sustainability	02	06	02	10
CO-3	Discuss the sustainable production and consumption	03	07	05	15
CO-4	How Climate Change may be Threat to Sustainable Development	-	10	05	15
CO-5	Role of Corporations and Ecological Sustainability	03	02	-	05
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply A: Analyse E:Evaluate C:Create

The end of semester assessment for Sustainable Development Goals will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to industry, water treatment plant
7. Demonstration
8. ICTBasedTeachingLearning(VideoDemonstration/TutorialsCBT,Blog,Fac eBook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	The Economics of Sustainable Development: The Case of India (Natural Resource Management and Policy)"	Surender Kumar and Shunsuke Managi	Springer Switzerland	2009
2	Corporate Social Responsibility in Developing and Emerging Markets	Onyeka Osuji	Cambridge	New Edition June 2022
3	Smart Cities for Sustainable Development	Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna	Springer Switzerland	March 2022
4	Sustainable Development: Linking Economy, Society, Environment	Tracey Strange and Anne Bayley		
5	Management Of Resources For Sustainable Devpt	Sushma Goyal	The Orient Blackswan	2016
6	Energy, Environment and Sustainable Development: Issues and Policies	S. Ramaswamy Sathis G. Kumar	Regal Publications	2009
7	The New Map: Energy, Climate, and the Clash of Nations	Daniel Yergin	Penguin Press	September 2015
8	Contributions of Education for Sustainable Development (ESD) to Quality Education:	Laurie, R., Nonoyama-Tarumi, Y., Mckeown, R., & Hopkins, C.	A Synthesis of Research. Journal of Education for Sustainable Development, 10(2), 226–242.	2016
9	Sustainable Results in Development: Using the SDGs for Shared Results and Impact	OECD	OECD Publishing, Paris	2019

10	Development Discourse and Global History from colonialism to the sustainable development goals	Ziai, Aram	Routledge, London & New York	2016
11	Sustainable Development Goals An Indian Perspective,	Hazra, Somnath., Bhukta, Anindya	Springer Switzerland	2020
12	Environmental Ecology, Biodiversity and Climate Change	HM Saxena	Rawat Publication	January 2021
13	https://www.un.org/sustainabledevelopment/			
14	https://www.aiu.ac.in/documents/AIU_Publications/UN-SDG goals			
15	https://www.unesco.org/en/education-sustainable-development			
16	https://onlinecourses.nptel.ac.in/noc23_hs57/preview			
17	ttps://www.iau-hesd.net/news/5180-berlin-declaration-education-sustainable development-adopted-unesco-esd-conference-17-19			

Curriculum Development Team

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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B.C.A.
Course Code: 0SDG01
Course Title: Sustainable Development Goals (SDGs

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help o AI and Data Science Technologies.
CO101.1: Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO101.2: Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO101.3: Understand the implications of overuse of resources,	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2

population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.																	
CO101.4: Develop skills to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development and apply critical thinking skills to evaluate the quality, credibility and limitations of an Argument for solution.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO101.5: Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational Programmes and processes.	-	-	-	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO101.1:** Examine critically the 17 newly minted UN Sustainable Development Goals and understand the historical evolution, key theories, and concepts of sustainable development.	SO1.1 SO1.2 SO1.3 SO1.4		Unit 1: Introduction to Sustainable Development 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO101.2:** Identify and apply methods for assessing the achievement of sustainable development and discover the science, technology, economics, and politics underlying the concepts of sustainability.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Special focus on SDG 4-Quality Education and Lifelong Learning: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO101.3:** Understand the implications of overuse of resources, population growth and economic growth and sustainability and explore the challenges the society faces in making transition to renewable resource use.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3.0 Understanding the SDGs 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO101.4:** Develop skills to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development and apply critical thinking skills to evaluate the	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4.0 Climate Change, Energy and Sustainable Development 4.1,4.2,4.3,4.4,4.5,4.6	

	quality, credibility and limitations of an argument for solution.				
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO101.5:** Describe the steps of the design thinking methodology and how design thinking can accelerate effective SDG implementation. Deepen knowledge and pedagogical tools to incorporate values-based education for sustainable development in educational Programmes and processes.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5.0 Sustainable Business Practices 5.1,5.2,5.3,5.4,5.5,5.6	

Semester-I

Course Code: 0EVS03

Course Title: Environmental Science

Pre- requisite: To study this course, the student must have a knowledge about the environmental components, pollution, biodiversity, and Ecosystem at senior secondary, Class 12th level.

Rationale: The students studying Environmental Science should possess foundational understanding about environment and its components. They should also know the importance of ecosystems in our surroundings.

Course Outcomes:

0EVS03.**1:** To understand various aspects of life forms, ecological, processes, and the impacts on them by the human during Anthropocene era.

0EVS03.**2:** To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make inform decisions.

0EVS03.**3:** To develop empathy for all life forms, awareness, and responsibility towards environmentalprotection and nature preservation.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credit (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Foun dation	0EVS03	Environmental Science	2	0	1	1	5	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Foundation	0EVS03	Environmental Education	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

0EVS03.1: To understand various aspects of life forms, ecological, processes, and the impacts on them by the human during Anthropocene era.

Approximate Hours

Item	AppX Hrs.
Cl	08
LI	0
SW	1
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Know multidisciplinary nature of environmental science. SO1.2 Learn about the natural resources. SO1.3 Know the problems associated with land resource. SO1.4 Learn the conservation of resources. SO1.5 Know alternative energy resources.	.	**Unit-1 Environment and Natural Resources:** 1.1 The Multidisciplinary nature of environmental studies. 1.2 Scope and Importance of Environmental studies 1.3 Components of Environment: 1.4 Atmosphere, Hydrosphere, 1.5 Lithosphere, and Biosphere. 1.6 Brief account of Natural Resources and 1.7 associated problems 1.8 Land Resource 1.9 Water Resource 1.10 Energy Resource 1.11 Concept of Sustainability and 1.12 Sustainable Development	i. What is environmental Science? ii. What are resources?

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- **i.** Write the definition and causes of soil erosion.
- **ii.** Define desertification and write its causes.
- **iii.** Describe structure of atmosphere.
- **iv.** Explain lithosphere.

0EVS03.2: To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make inform decisions.

Approximate Hours

Item	AppX Hrs
Cl	05
LI	0
SW	2
SL	2
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the concept of ecosystem. **SO2.2** Learn the structure of ecosystem. **SO2.3** Know the function of ecosystem. **SO2.4** Describe the structure of forest ecosystem. **SO2.**5 Learn about biodiversity and its conservation.		Unit-2 Biomes, **Ecosystem and Biodiversity** 2.1 Major Biomes: Tropical, Temperate, Forest, Grassland, Desert, 2.2 Tundra, Wetland, 2.3 Estuarine and Marine Ecosystem: Structure 2.4 Function and types their Preservation 2.5 Restoration Biodiversity and its conservation practices.	i. What is biotic and abiotic components of environment? ii. What are interactions?

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. What do you mean by ecosystem? Describe the structure of ecosystem.
ii. Give a brief classification of ecosystem.
iii. Write the function of an ecosystem.
iv. Define biodiversity write strategies of biodiversity conservation.

b. Mini Project:

Visit to various ecosystem and study biotic and abiotic ecosystem.

0EVS03.3: To develop empathy for all life forms, awareness, and responsibility towardsenvironmental protection and nature preservation.

Approximate Hours

Item	AppX Hrs
Cl	07
LI	0
SW	02
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1. Learn about pollution and its sources. **SO3.2** Know the sources of different pollutant. **SO3.3** Understand the law & legislation related to environment. **SO3.4** Learn the control of pollution. **SO3.**5 Describe the role of information technology in environment and human health.		Unit-3: **Environmental Pollution, Management and** Social **Issues:** 3.1 Pollution: Types, Control measures, 3.2 Management and associated problems. 3.3 Environmental Law and Legislation: 3.4 Protection and conservation Acts. International Agreement & **Program** 3.5 Environmental Movements, communication and public awareness Program. 3.6 National and International organizations related to environment conservation and monitoring. 3.7 Role of information technology in environment and human health.	i. What is pollution basic introduction? ii. What is pollutant?

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Write an essay on air pollution.
ii. What do you mean by acid rain write its causes and effects.
iii. Describe the effects of water pollution.
iv. How soil pollution can be control?

v. Describe the role of information technology in environment and human health.

vi. Mention some national and international organizations related to environment conservation and monitoring.

b. Other Activities (Specify):

Visit to different polluted sites and study the source of pollution and their effects.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO.1: To understand various aspects of life forms, ecological processes, and the impacts on them by the human during Anthropocene era.	10	1	2	13
CO.2: To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make inform decisions.	10	2	2	14
CO.3: To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.	10	2	2	14
Total Hours	30	05	06	41

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Environment and Natural Resources:**	03	01	01	05
CO-2	Biomes, **Ecosystem and Biodiversity**	02	06	02	10
CO-3	**Environmental Pollution, Management and** Social **Issues**	03	07	05	15
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Fundamental of Environmental Science will be held with written

examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to cement plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Ecology; Environment Science and Conservation	Singh; J.S., Singh S.P. and Gupta, S. R	S. Chand publishing, New Delhi.	2018
2	Perspectives in Environmental Studies	Kaushik, Anubha, Kaushik, C.P.	New age International Publishers	2018
3	A Textbook of Environmental Studies	Asthana, D. K Asthana Meera	S. C1iand.Publishing, New Delhi	2007
4	Environmental Law and Policy in India: Cases, Material & Status	Divan, S. and Rosenkranz, A	Oxford University Press, India	2002

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COs, POs and PSOs Mapping

Course Name: BCA
Course Code: 0EVS03
Course Title: Environmental Education

Course Outcomes	Program Outcomes												Program Specific Outcomes				
	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	Engineering knowledge	Problem Analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning					
0EVS03.1: To understand various aspect sof life forms, ecological processes, and The impact s on them by the human during Anthropocene era.	1	3	1	3	3	1	3	3	1	1	1	3	2	2	3	3	
0EVS03.2: To build capabilities to identifyrelevant environ mental issues, analyzethe various underlying causes, evaluatethe practices and policies, and developframework to make, and develop	1	2	2	2	2	1	3	3	1	2	1	3	2	3	2	3	
0EVS03.2: To build capabilities to identifyrelevant environ mental issues, analyzethe various underlying causes, evaluatethe practices and policies	1	2	2	2	2	1	3	3	1	2	1	3	2	3	2	3	

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO.1:** To understand various aspects of life forms, ecological processes, and the impacts on them by the human during Anthropocene era.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1 1.1,1.2,1.3,1.4,1.5,1.6,	As mentioned in page number above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO.2:** To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make inform decisions.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 1.1,1.2,1.3,1.4,1.5,1.6,1.7	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO.3:** To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 1.1,1.2,1.3,1.4,1.5,1.6,1.7	

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

Semester-I

Course Code: 01CA112

Course Title : Computer Fundamentals, Organization and Architecture

Pre- requisite: To study this Course, a student must have basic knowledge of computers

Rationale: Study of Computer Fundamentals will help students to understand Organization and Architecture data. Insights from Organization and Architecture help students in industry placements. Good knowledge of Organization and Architecture will provide students chance to appear in product bases companies also students will able to develop problem solving skills after the study of this subject.

Course Outcomes:

01CA112.1: Understand the basic stricture, operation and characteristics of digital computer
01CA112.2: Design simple combinational digital circuits based on given parameters.
01CA112.3: Understand the working of arithmetic and logic unit.
01CA112.4: Know about hierarchical memory system including cache memories and virtual memory.
01CA112.5: Know the contributions of Indians in the field of Indians in the field of computer architecture and related technologies.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credit (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Major	01CA112	**Computer Fundamentals, Organization and Architecture**	4	4	2	1	11	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Major	01CA112	Computer Fundamental, Organization and Architecture	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Major	ES104	Computer Fundamental, Organizationand Architecture	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI),

Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

01CA112.1: Understand the basic stricture, operation and characteristics of digital computer

Approximate Hours

Item	AppX Hrs.
Cl	12
LI	12
SW	2
SL	1
Total	27

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand computer and characteristics, capabilities and limitations **SO1.2 Explain** work station **SO1.3 Discuss** Smart system **SO1.4** Definition of Embedded system, GIS, GPS **SO1.**5 Explain Public domain and services	1. Identify various parts of the computer by physical examination 2. Identify various parts inside the CPU like motherboard, SMPS, 3. Identify various parts ports, buses, IC chips, Processor, HDD, RAM etc. 4. Explore Contributions of Dr. Vinod Dham 5. Explore Contributions of Dr. Ajay Bhat 6. Explore Contributions of Dr. Vijay P Bhatkar	**Unit-1 Fundamentals of computers:-** 1.1 Definition, Characteristics, capabilities and limitations 1.2 Types of Computers: -Analog, Digital, Micro 1.3 Mini, Mainframe & Super Computers 1.4 Work Station, Server computers, 1.5 Generations of Computers 1.6 Smart Systems: definition, characteristics and applications. 1.7 Definition of Embedded system, 1.8 GIS, GPS, 1.9 Cloud Computing. 1.10 Uses of computers in e-governance and various 1.11 Public domains and various public domains and services. 1.12 Contributions of reputed scientists of Indian origin like Dr. Vinod Dham Father of Intel Pentium Processor, Dr. Ajay Bhat-Co-Inventor of USB Technology, Dr. Vinod Khosla-co-founder of Sun Microsystems, Dr. Vijay P Bhatkar-architect of India's national initiative in supercomputing, and many others	1. OMR, OCR, minicomputer, super computer 2. GIS, GPS

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. i Generations of Computers

ii Types of Computers: -Analog, Digital, Micro

iii Mini, Mainframe & Super Computers

c. Major - Paper I:

d. Other Activities (Specify): Seminar

01CA112.2**: Design simple combinational digital circuits based on given parameters**

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	2
SL	1
Total	27

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand the Block diagram **SO2.2** To learn different types of software **SO2.3** To lean about the types of input devices **SO2.4 Explain** OMR, OCR, MICR, track ball, joystick, touch screen **SO2.**5 Types of printer	1. Identify various input devices available in the lab physically. 2. Identify various output devices available in the lab physically. 3. Verification and interpretation of truth able for AND, OR, NOT gates. 4. Compare various types of printers 5. Compare features of various storage devices 6. Compare various scanners. .	Unit-2 **Block diagram of computer:** **2.1** Block diagram of computer and its functional units **2.2** Concept of hardware, software and firmware **2.3** Types of software**.** **2.4 Input devices**- keyboard, scanner, mouse, light pen, bar code reader **2.5** OMR, OCR, MICR, track ball, joystick, touch screen **2.6** camera, mic etc. Output devices, monitors c**lass**ification of monitors based **2.7** Technology -CRT & flat panel, LCD, LED monitors, speakers **2.8** printers dot matrix printer, ink jet printer, laser printer, 3D Printers **2.9** Wi-Fi enabled printers, platters and their types, LCD/LED projectors. **2.10** Computer memory and its types, Storage devices Magnetic tapes, Floppy Disks **2.11** Hard Disks, Compact Disc CD-ROM, CD-RW, VCD. DVD, DVD-RW **2.12** USB drives, Blue Ray Disc, SD/MMC Memory cards.	1. Types of software 2. input devices 3. output devices

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Input devices- keyboard, scanner, mouse, light pen, bar code reader

ii. Camera, mic etc. Output devices, monitors classification of monitors based

b. Major - Paper I:

c. Other Activities (Specify):

01CA112.3**:** Understand the working of arithmetic and logic unit.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	2
SL	1
Total	27

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 To Understand the basic digital electronics **SO3.2** To learn different types of gates **SO3.3** To understand the Boolean algebra and laws **SO3.4** To design a flip flop	1 Verification and inter predation of truth table for NAND, NOR gates 2 Verification and inter predation of truth able for Ex-OR, x-NOR gates 3. and interpredation of truth able for Decoder 4.Verification and inter predation of truth able for Encoder 5. Verification and inter predation of truth able for Multiplexer 6.Verification and inter predation of truth able for Demultiplexer	**Unit-3 : Fundamentals of Digital Electronics:** **3.1** Data Types, Complements, Fixed-Point Representation **3.2** Binary and other Codes, Error Detection Cedes **3.3 Logic Gates**, Boolean Algebra, Map Simplification **3.4** Combinational Circuits, Sequential Circuits **3.5** simple combinational circuit design problems **3.6 combinational circuit.** Adder – Sub tractor, **3.7** Multiplexer De multiplexer **3.8** Decoders, Encoders. **3.9 Sequential Circuits-** **3.10** Flip-Flops, **3.11** Registers, **3.12** Counters	1. **Logic Gates**, Boolean Algebra 2. Flip-Flops, Registers 3. Binary and other Codes

SW-3 Suggested Sessional Work (SW):

A **Assignments:**

a. Data Types, Complements, Fixed-Point Representation

b. **Logic Gates**, Boolean Algebra, Map Simplification

Major - Paper I:

Other Activities (Specify):

01CA112.4**:** Know about hierarchical memory system including cache memories and virtual memory.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	2
SL	1
Total	27

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Evaluation of programmed control unit **SO4.2** Understanding the Introductory concept of RISC, CISC **SO4.3** Data Transfer & Manipulation **SO4.4** To lean about the pipelining **SO4.**5 Handling Data hazards	1. Study of half adder using XOR and NAND gates and verification ofits operation 2. Study of full adder using XOR and NAND gates and verification of its operation. 3. use of handling data hazards. 4. Use of control hazards 5. Example of pipelining 6. Example of instruction format	**Unit-4 : Processor and Control unit:** **4.1** Hardwired vs. Micro **Program**med Control Unit **4.2** General Register Organization **4.3** Stack Organization, Instruction Format **4.4** Data Transfer **4.5** & Manipulation **4.6 Program** Control, Introductory concept of RISC, CISC **4.7** advantages and disadvantages of both **4.8** Pipelining-concept of pipelining, 4.9 introduction to Pipelined **4.9** data path and control **4.10** Handling Data hazards **4.11** Control hazards **4.12** Case study	1. Pipelining-concept of pipelining 2. Stack Organization, Instruction Format 3. Handling Data hazards & Control hazards

SW-4 Suggested Sessional Work (SW):

a. Assignments:

a. Introductory concept of RISC, CISC

b. Pipelining-concept of pipelining

d. Major - Paper I:

C. Other Activities (Specify):

01CA112.5**:** Learn memory and I/O system

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	2
SL	1
Total	27

ession Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Over view of various I/O Interface **SO5.2 Explain** Data Transfer Schemes-Program **SO5.3** To understand the high-speed memories **SO5.4** To understand Main memory & its types, Auxiliary memory **SO5.**5 hardware support for memory	1. Study of half sub tractor and verification of its operation 2. Study of full sub tractor and verification of its operation 3. Study of various flip flops	**Unit 5: Memory and I/O Systems –** 5.1 Peripheral Devices, I/O Interface, 5.2 Data Transfer Schemes-Program Control, Interrupt 5.3 DMA Transfer, IO Processor 5.4 Memory Hierarchy, 5.5 Processor vs. Memory Speed 5.6 High-Speed Memories 5.7 Main memory & its types, 5.8 Auxiliary memory 5.9 Cache Memory, Associative Memory 5.10 Interleaving, concept of 5.11 Virtual Memory, Hardware support for Memory Management. 5.12 Parallel Computing projects of India PARAM, ANUPAM, FLOSOLVER, CHIPPS etc. Other relevant contributors and Contributions	1 **Data Transfer Schemes-Program** Control, Interrupt 2 Memory Hierarchy, Processor vs. Memory Speed

SW-4 Suggested Sessional Work (SW):

A. Assignments:

a. Memory Hierarchy, Processor vs. Memory Speed
b. Interleaving, concept of Virtual Memory
c. Hardware support for Memory Management.

B. Major - Paper I:

C. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	**Class Lecture (Cl)**	**Sessional Work (SW)**	**Self-Learning (Sl)**	**Total hour (Cl+SW+Sl)**
01CA112.1:Understand the basic stricture, operation and characteristicsof digital computer	12	02	01	15
01CA112.2: Design simple combinational digital circuits based ongiven parameters.	12	02	01	1
01CA112.3: Understand the working of arithmetic and logic unit.	12	02	01	15
01CA112.4: Know about hierarchical memory system including cachememories and virtual memory.	12	02	01	15

01CA112.5: Know the contributions of Indians in the field of Indiansin the field of computer architecture and related technologies.	12	02	01	15
Total Hours	60	10	5	75

Suggestion for End Semester Assessment: suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
01CA112-1	**Fundamentals of computers**	03	02	03	08
01CA112-2	**Input devices-**	03	01	05	09
01CA112-3	**Fundamentals of Digital Electronics**	03	07	02	12
01CA112-4	**Processor and Control Unit:**	03	05	05	13
01CA112-5	**Memory and I/O Systems**	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with writtenexamination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to cement plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	**Computer Fundamentals, Organization and Architecture**	P K Sinha	**BPB Publications**	6th 30 November 2004
2	**Computer organization**	**v.carl Hamacher**	TMH	

Curriculum Development Team

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CO, PO and PSO Mapping

Course Title: B.C.A
Course Code: 01CA112
Course Title: **Computer Fundamentals, Organization and Architecture**

	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
ourse Outcomes	**Engineering knowledge**	**Problem analysis**	**Design/development of solutions**	**Conduct studies of difficult problems**	**Utilization of modern tools**	**Engineers and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-longlearning**	**Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity**	**Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings**	**Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.**	**Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science**	**Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.**
CO1:The student will define the basic components of computer system and its operations	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**

CO2:The student will describe the building blocks of computer system	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
CO3:Student will execute Instruction code and use addressing modes	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO4: The student will differentiate various types of memory	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO.5: The student will compare various microprocessors and select DMA in computer system	-	-	-	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1:The student will define the basic components of computer system and its operations	SO1.1 SO1.2 SO1.3 SO1.4	1,2,3,4,5,6	UNIT – I: Fundamentals of computers:- 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2:The student will describe the building blocks of computer system	SO2.1 SO2.2 SO2.3 SO2.4	1,2,3,4,5,6	UNIT – II: Block diagram of computer 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3:Student will execute Instruction code and use addressing modes	SO3.1 SO3.2 SO3.3 SO3.4	1,2,3,4,5,6	UNIT – III: :Fundamentals of Digital Electronics: 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: The student will differentiate various types of memory	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	1,2,3,4,5,6	Unit-4: Processor and Control unit: 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO.5: The student will compare various microprocessors and select DMA in computer system	SO5.1 SO5.2 SO5.3 SO5.4	1,2,3,4,5,6	Unit-5: Memory and I/O Systems – 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO.5: Know the contributions reputed scientists of Indian origin	SO6.1 SO6.2 SO6.3 SO6.4	1,2,3,4,5,6	Unit-6: Indian contribution to the field 6.1,6.2,6.3,6.4,6.5,6.6,6.7	

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of BCA Program

Semester-I

Course Code: **02CA121**
Course Title: PROGRAMMING IN C
Pre-requisite: Student should have a basic understanding of Fundamental of Computer.
Rationale: Importance of C programming and its practical applications C programming language holds immense importance in the software development industry. Its simplicity, efficiency, and versatility make it a powerful tool for developing a wide range of applications. From operating systems to embedded systems, C finds its use in numerous domains.

Course Outcome:

02CA121.1: Explain the core concept of C programming Algorithms and Flowcharts.
02CA121.2: Use various input output operations and control statements.
02CA121.3: Use Array and Function in programs.

02CA121.4: Describe the pointers and use of structure and union
02CA121.5: Use File handling Programs.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
Minor	02CA121	**PROGRAMMING IN C**	4	4	1	1	10	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, fielder other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW&SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment(Marks)							
			Progressive Assessment(PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/HomeAssignment5number 3 marks each (CA)	Class Test 2 (2best out of3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Minor	02CA121	Programming in C Language	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Minor	ES104	Programming in C Language	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

02CA121.1: At the end of this chapter the student will explain the core concept of C programming Algorithms and Flowcharts.

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of BCA Program

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

SW-1 Suggested Sessional Work (SW):

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand about Language and programming paradigm. **SO1.2** Understand Over view of procedural Programming and object-oriented Programming **SO1.3** Understand Algorithms Flow Charts - Symbols, Rules for making. **SO1.4** Understand Flow chart, Types of flowcharts **SO1.5** Understand about techniques of problem solving: Programming Techniques — Top down, bottom up, Modular **SO1.**6 use of Structured - Features, Merits & Demerits **SO1.7** Learn about Programming Logics- Simple Branching, Looping Recursion, Cohesion & Coupling. **SO1.8** Learn about the Programming. Testing & debugging & their Tools.	LI1.1. Write an algorithm to print the sum and product of digits of an integer. LI 1.2 Draw a flowchart to find greatest between 2 numbers. LI1.3 Write an algorithm to check the inputted year is leap year or not. LI 1.4 Draw a flowchart for calculation factorial of given number. LI1.5 Draw a flowchart for calculation Fibonacci of given number LI1.6. Write an algorithm to print sum of first 10 natural numbers.	**Unit-1.0 Introduction**: 1.1 Programming Paradigm. 1.2 Overview of object-oriented Programming. 1.3 Understanding Algorithms 1.4 C program structure 1.5 Flowcharts and its Symbols 1.6 Programming logics 1.7 use of Structured 1.8 - Features, 1.9 Merits& 1.10 Demerits 1.11 Testing & debugging & 1.12 theirTools	1. Use of algorithms for develop program. .

SW: 1. Assignment

02CA121.2: At the end of this chapter the student will use various input output operations and control statements.

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of BCA Program

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand about language and programming paradigm. **SO2.2** Understand about use of Character set **SO2.3** Use of Identifier and keyword **SO2.4** Understand about Data Types **SO2.5**Understand about constant and variable. **SO2.**6 use of operator in programming **SO2.7**Learn about the decision control statements in C language. **SO2.**8 Learn about the Looping Statement in C programming.	LI2.1. Write a program to print the sum of digits of an integer. LI2.2.product of digits of an integer. LI 2.3 Write a program to reverse digit of a number. LI2.4 Write a program to compute the sum of the first n terms of the following series S = 1+1/2+1/3+1/4+…… LI 2.5. WAP to computethe sum of the first n terms of the following series S =1-2+3- 4+5…… LI2.6. Example of if else statement	**Unit-1.0 Introduction**: 2.1 Programming Paradigm. 2.2 C-Character Set. 2.3 Identifier and Keyword 2.4 Data Types 2.5 Constant and Variable 2.6 Operator 2.7 Decision Control Statement 2.8 Decision Control Statement 2.9 Looping control Statement 2.10 Looping control Statement 2.11 For loop 2.12 While loops	1. Create program in C use of decision and looping statement.

SW-2 Suggested Sessional Work (SW):

a) Assignments:

- Create a program in C to check the input no is prime or not.

- Create a program in C to print a factorial of given no.

b) Mini Project:

- C Program to Make a Simple Calculator Using switch...case.

c) Other Activities (Specify):

- Printing patterns using C programs

02CA121.3: At the end of this chapter the student will use Array and Function in programs.

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes(SOs)	**LaboratoryInstruction(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand Array.**SO3.2** Types of arrays. **SO3.3** Use of function **SO3.4** Understand about call by value andcall by reference **SO3.5** Understand about storage classes. **SO3.6** use of String functions	LI 3.1 Write a function that checks whether agiven string is Palindrome or not. LI3.2.Use this function to find whether the stringentered by user is Palindrome or not. LI 3.3 Write a program that prints a table indicating the number of occurrences of each alphabet in the text entered ascommand line arguments. LI 3.4 Program for factors of a given number. LI3.5 Program for call by value and call by reference LI3.6 Program for for and while loop	**Unit-3.0 Array**: 3.1 Defining, Declaring and 3.2 Initializing Array. 3.3 Types of Arrays. 3.4 Types of Arrays. 3.5 C-Function: 3.6 Declaration and definition 3.7 Call by value 3.8 and call by reference 3.9 Storage Classes 3.10 Storage Classes 3.11 String functions 3.12 Learning by example	1. Use of array for develop program. 2. Create program in C use of function.

SW-2 Suggested Sessional Work (SW):

a) Assignments:
- Create a program in C to create two-dimensional array.

b) Mini Project:
- C Program to add two matrices.

c) Other Activities (Specify):
- Printing patterns using C programs

02CA121.4: At the end of this chapter the student will describe the pointers and use of structure and union.

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand about pointer. **SO4.2** Declaration of pointer **SO4.3** Use of pointer with array **SO4.4** Use pointer with function **SO4.5** Understand about pointer and structure. **SO4.**6 preprocessor, #define defining functions **SO4.7** Use of structure and union, pointer within structure.	LI 4.1 Write a program that swaps two numbers using pointers. LI 4.2 Write a program in which a function is passed address of two variables and then alter its contents. LI 4.3 Write a program to calculate area of circle using preprocessor directives LI4.4 Program for pointer LI4.5 Program for pointer to structure LI4.6 Program for pointer to pointer	**Unit-4.0 Pointer** 4.1 Introduction, Features 4.2 Declaring Pointer 4.3 Pointer to Array 4.4 Pointers to Function 4.5 Pointers to Function 4.6 Pointer to Structure 4.7 Pointer to Structure 4.8 Pointer within Structure 4.9 preprocessor, #define 4.10defining functions 4.11learning by example 4.12Implementation	1. Use of Pointer 2. use of structure and union 3. use of preprocessor, #define defining functions

SW-1 Suggested Sessional Work (SW):

a) Assignments:
- Create a program in C to check the input no is prime or not.
- Write difference between structure and union.

b) Other Activities (Specify):

02CA121.5: At the end of this chapter the student will use File handling Programs

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand about file handling. **SO5.2** File handling function **SO5.3** Random access file **SO5.4** Learn graphics programming **SO5.5** Use of command line argument.	LI5.1WAP to display Fibonacci series Using recursion, LI5.2 WAP to display Fibonacci series Using iteration LI 5.3 WAP for File handling LI5.4 Write a program to copy data from one file to another. LI5.5 WAP for random access file handling LI5.6 WAP for command line arguments	**Unit-5.0 File Management** 1. Introduction, Text vs Binary File. 2. Declaring Pointer 3. File Handling: 4. fopen (), fclose (), 5. getc (), putc (), gets (), puts (), 6. fprintf: fopen (), 7. fclose (), getc 8. (), putc (), gets (), 9. puts (), fprintf (), fscanf (), 10. Random Access File, fseek (), ftell (), 11. rewind(). 12. Command Line Arguments	1. Use of file handling. 2. Command Line Arguments

SW-1 Suggested Sessional Work (SW):

a) Assignments:
- Create a program in C to store and read a file content in C.
- Create a program in C to draw and fill rectangle.
- Write a program in C draw polygon.

b) Other Activities (Specify):
- Printing patterns using C programs

Course Out Comes	Class Lecture (Cl)	Laboratory Instructions (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour(Cl+SW+Sl)
02CA121.1: Explain the core concept of C programming Algorithms and Flowcharts.	12	12	1	1	14
02CA121.2: Use various input output operations and control statements.	12	12	1	1	14
02CA121.3: Use Array and Function inprograms.	12	12	1	1	14
02CA121.4: Describe the pointers and use ofstructure and union	12	12	1	1	14
02CA121.5: Use File handling Programs.	12	12	1	1	14
Total Hours	60	60	1	1	122

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
02CA121.1: Explain the core concept of C programmingAlgorithms and Flowcharts.	Unit – I: Introduction C	03	04	03	10
02CA121.2: Use various input output operations andcontrol statements.	UNIT 2: Introduction Of Programming Paradigm	05	03	02	10
02CA121.3: Use Array an Function in programs.	Unit – Iii: Array	05	02	03	10
02CA121.4: Describe the pointers and use of structure and union	Unit-4: Pointer	04	04	02	10
02CA121.5: Use File handlingPrograms.	Unit-5: File Management	03	05	2	10
Total		20	15	15	50

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/ Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry.
7. Demonstration
8. ICTBasedTeachingLearning(VideoDemonstration/TutorialsCBT,Blog,Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition &Year
1	The C Programming Language	Kernighan, Ritchie	Prentice Hall of India.	Revised edition21edition2020
2	Programming Language Concepts	Carlo Ghazi, Mehdi Jazayeri	John Wiley and Sons	1999
3	Programming in ANSI C	E. Balagurusamy	Tata McGraw Hill	2002
4	Let Us C	Yashavant Kanetkar	Seventh Edition, BPB Publications	2007
5	Programming in C	Reema Thareja	Oxford University Press India, Noida	

Curriculum Development Team

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COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 02CA121
Course Title: PROGRAMMING IN C

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO.1: Explain the core concept of C programming Algorithms and Flowcharts.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

CO.2: Use various input output operations and control statements.	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
CO.3: Use Array and Function in programs.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO.4: Describe the pointers and use of structure and union	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO.5: Use File handling Programs.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5,6,7	**CO.1:** Explain the core concept of C programming Algorithms and Flowcharts.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LI1.1 LI1.2 LI1.3 LI1.4	UNIT – I: Introduction C: 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO.2:** Use various input output operations and control statements.	SO2.1 SO2.2 SO2.3 SO2.4	LI2.1 LI2.2 LI2.3 LI2.4	UNIT – II: Introduction of Programming Paradigm 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO.3:** Use Array and Function in programs.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6	LI3.1 LI3.2 LI3.3	UNIT – III: Array 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO.4:** Describe the pointers and use of structure and union	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	LI4.1 LI4.2 LI4.3	Unit-4: Pointer 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO.5:** Use File handling Programs.	SO5.1 SO5.2 SO5.3 SO5.4	LI5.1 LI5.2	Unit-5: File Management 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,4.11,4.12	

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of BCA Program

Semester-I

Course Code: **03MS173**

Course Title: Discrete Mathematics

Pre- requisite: Basics Mathematics

Rationale: Concepts and notations from discrete mathematics are useful in studying and describing objects and problems in branches of computer science, such as computer algorithms, programming languages, cryptography, automated theorem proving, and software development.

Course Outcome:

03MS173.1: Understand concepts of relation & lattices
03MS173.2: Apply the Boolean algebra switching circuits and their application.
03MS173.3: Graph, their types and its application in study of shortest path algorithm
03MS173.4: Apply the tree & matrix in problem
03MS173.5: Understand the discrete numeric function generating functions and Recurrence relation.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Open Elective	03MS173	Discrete mathematics	4	0	1	1	5	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, fielder other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW&SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each	Class Test 2 (2 best out of 3)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	
OE	03 MS 173	Discrete mathematics	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

03MS173.1: Understand concepts of relation & Lattices

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

SO1.1 Understand the concept of relations **SO1.2** Understand the concept of lattices **SO1.3** Apply types of relation and lattices	.	**Unit-1.0** understand concepts of relation & lattices I. 1.1 Binary relation 1.2 Inverse relation 1.3 Composite & 1.4 equivalence relation 1.5 equivalence classes & 1.6 its property 1.7 portions of sets 1.8 totally order sets & 1.9 Hesse diagram 1.10 lattice 1.11 lattice, 1.12 Examples & types	1. To solve numerical based question 2. Draw the Hesse diagram

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on back propagation.
ii. Numerical based on radial basis.
iii. Numerical based on recurrent network.

03MS173.2: Apply the Boolean algebra switching circuits and application

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	1
SL	1
Total	14

session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

SO2.1 Understand the concept of Boolean Algebra **SO2.2** Use the Boolean algebra **SO2.3** Switching circuit	.	**Unit-2.0** Apply the Boolean algebra switching circuits and their application II. 2.1. Boolean algebra 2.2. Definition & 2.3. properties of Boolean algebra 2.4. Switching circuits and 2.5. its application 2.6. Boolean function 2.7. Disjunctive & conjunctive 2.8. Bool's expansion theorem 2.9. Karnaugh map-1 2.10. Karnaugh map-2 2.11. Minimize the Boolean function 2.12. Normal forms	1. How Boolean algebra is used to solve real life problems. 2. Numerical based on Boolean Algebra

SW- Suggested Sessional Work (SW):

Assignments:

i. Numerical based on Fuzzy logic.
ii. Numerical based on Membership Function.
iii. Numerical based on Genetic algorithm.

03MS173.3: Graph, their types and its application in study of shortest path algorithm

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the concept of graph and search tree **SO3.2** Use Graphs search algorithms **SO3.3** Apply shortest path algorithms	.	**Unit-3.0** graph, their types and its application in study of shortest path algorithm 3.1. Basic concepts of graph 3.2. Basic concepts of search algorithm. 3.3. Types of graphs-1 3.4. Types of graphs-2 3.5. Application of graph 3.6. Walk 3.7. path and 3.8. circuit 3.9. Dijkstra's algorithm for shortest path. 3.10. Hamiltonian path and 3.11. circuit 3.12. Weighted graph	1. Compare and analyze all search algorithm.

SW- Suggested Sessional Work (SW):

Assignments:

i. Numerical based on Fuzzy logic.
ii. Numerical based on Membership Function.
iii. Numerical based on Genetic algorithm.

03MS173.4: Apply tree and Matrix in problems

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the concept of Trees representation	.	**Unit-4.0 Apply tree and Matrix in problems**	1. Compare and analyze all Tree algorithm. 2. Numerical based on problems

SO4.2 Use of Trees **SO4.3** Apply Tree; spanning tree, cut-set, Matrix representation of graph		4.1. Trees representation 4.2. Structured representation: frames 4.3. Definition of Trees and 4.4. its properties 4.5. Rooted, binary and 4.6. spanning tree 4.7. Rank and nullity of a graph 4.8. Kruskal's and prim's Algorithm 4.9. Fundamental circuit and Cut-set and its properties 4.10. Planar graphs 4.11. Matrix representation of graphs 4.12. Types of matrix	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Questions based on frames.
ii. Questions based on scripts.
iii. Questions based on formal logic.

03MS173.5: Understand the discrete numeric functions, generating function and Recurrence relation

Approximate Hours

Item	AppX Hrs
Cl	12
LI	00
SW	01
SL	01
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand the concept of discrete numeric function **SO5.2** Concept of Recurrence relations and recursive algorithms **SO 5.3** Solution of generating function	.	**Unit-5.0 Understand the discrete numeric functions, generating function and Recurrence relation** 5.1. Operation on numeric function 5.2. Asymptotic 5.3. Behavior of numeric function 5.4. Generating function 5.5. Recurrence relation 5.6. Recurrence relation with constant coefficients 5.7. Homogeneous solution-1 5.8. Homogeneous solution-2 5.9. Particular solution 5.10. Solution by the method of generating functions	1. Compare and analyze all techniques.

		5.11. Total solution 5.12. Linear recurrence relation	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Different types of learning techniques.

ii. Use of Dempster-Shafer Theory of Evidential reasoning

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
03MS173.1 Understand concepts of relation &Lattices	12	1	01	14
03MS173.2: Apply the Boolean algebra switching circuits and application	12	1	01	14
03MS173.3: Graph, their types and its application in study of shortest path algorithm	12	1	01	14
03MS173.4: Apply tree and Matrix in problems	12	1	01	14
03MS173-5: Understand the discrete numeric functions, generating function and Recurrence	12	1	01	14
Total Hours	60	5	5	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
03MS1731.1 Understand concepts of relation & Lattices	Understand concepts of relation & Lattices I.	03	02	03	08
03MS173.2: Apply the Boolean algebra switching circuits and application	Apply the Boolean algebra switching circuits and application	03	01	05	09
03MS173.3: Graph, theirtypes and its application in study of shortest path algorithm	Graph , their types and its application in study of shortest path algorithm	03	07	02	12

03MS173.4: Apply tree andMatrix in problems	Apply tree and Matrix in problems.	03	05	05	13
03MS173-5: Understandthe discrete numeric functions, generating function and Recurrence	Understand the discrete numeric functions, generating function and Recurrence	03	02	03	08
Total		15	17	18	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Introduction to Portland cement will be held with writtenexamination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to cement plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Artificial Intelligence: Structures and strategies forComplex Problem Solving	J.P. Tremblay and R. Manohar	McGraw Hill Education	1st edition, 2017
2	Artificial Intelligence: A Modern Approach		McGraw Hill education	4th edition 2017
3	Lecture note provided by Dept. of CS&E, AKS University, Satna.			

Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Artificial Intelligence	Prof. Bhushan Trivedi	GLS University
2.	Artificial Intelligence: Search Methods for Problem Solving	Prof. Deepak Khemani	IIT Madras
3.	Fuzzy Logic and Neural Networks	Prof. Dilip Kumar Pratihar	IIT Kharagpur

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COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 03MS173
Course Title: Discrete Mathematics

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
03MS173.1:Understand conceptsof relation & Lattices I.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

03MS173.2:Apply the Boolean algebra switching circuitsand application	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
03MS173.3 : Graph , their types and its application in study of shortest path algorithm	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
03MS173.4: Apply tree andMatrix in problems.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
03MS173.5:Understand the discrete numeric functions, generating function and Recurrence	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5,6,7	**03MS173.**1:Understand concepts of relation & Lattices I.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		UNIT – I: 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**03MS173.**2:Apply the Boolean algebra switchingcircuits and application	SO2.1 SO2.2 SO2.3 SO2.4		UNIT – II: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**03MS173.**3:Graph, their types and itsapplication in study of shortest path algorithm	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6		UNIT – III: 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**03MS173.**4: Apply tree and Matrix in problems.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4: 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**03MS173.**5:Understand the discrete numeric functions, generating function and Recurrence	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5: 5.1,5.2,5.3,5.4,5.6,5.7,5.8,5.9,5.10	

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-II

Course Code: OSSD02

Course Title: Communication skills

Pre-requisite: Students must have basic knowledge of English language.

Rationale: In order to compete in this fast-growing world, LSWR skills of the students should be well developed and enhanced. Besides, they must have effective communication skills as it plays a vital role in shaping individual's personality and career. It also booststhe confidence and prepares them to face the audience fearlessly.

Course Outcomes:

After completion of the course:

OSSD02.1 Speak confidently in public as all the topics chosen emphasis on improving speaking skills anddeveloping self confidence amongst them.

OSSD02.2 Interact properly with improved Leadership Skills, Problem Solving Skills, Social skills andCommunication Skills. Students will also be able to understand the Importance of Team Work.

OSSD02.3 Communicate effectively in Hindi and English languages without hindrances.

OSSD02.4 Convey their messages accurately by understanding the significance of grammar as it plays a vitalrole in improving speaking and writing skills.

OSSD02.5 Understanding of Indian Culture and English Language will be developed through the study of Dramas and Poems written by Indian Writers.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Foun dation	OSS D0 2	Communication skills	2	0	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/HomeAssignment5 number 3 marks each (CA)	Class Test 2 (2 best out Of 3) 10	Seminar one **(Presentation)** (SA)	Class Activity any	Class Attendance	Total Marks (CA+CT+SA+CAT		
Foundation	OSSD02	English Communication	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

OSSD02.1: Speak confidently in public as all the topics chosen emphasis on improving speaking skills and developing self confidence amongst them.

Approximate Hours

Item	Appx. Hrs.
Cl	6
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Students will be able to introduce themselves		**Unit 1- Self-grooming, Basic Etiquettes and Presentation Skill**	1. Prepare a presentation on the given topics.

SO1.2 Understand the concept of Oral Presentation SO1.3 Students will be able to dress and present effectively SO1.4 Understand the importance of Body Language SO1.5 Students will be able to influence mass through skit and dramas.		1.1 Self-introduction 1.2 Oral Presentation Oral Presentation on: The importance of Education The importance of English in Today's World 1.3 Necessity of uniforms in a college Professional dressing and grooming etiquettes. 1.4 Body Language tips and techniques. 1.5 Role play Role play was conducted on following topics: Classroom interaction, 1.6 Hospital Scene and Scene at Railway station.	2. Prepare a play on the given topics.

OSSD02.2: Interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand the Importance of Team Work.

Approximate Hours

Item	Appx. Hrs.
Cl	7
LI	0
SW	1
SL	1
Total	9

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand the techniques of Group Discussion **SO2.2** Understand the concept of Debate **SO2.3** Students will be able to design a professional resume and crack interview **SO2.4** Explain the concept of how to ace in an interview. Interview Skills and Resume Writing	2.1.	**UNIT 2 – Confidence building skills,** 2.1. Group Discussion, Group Discussion on impact of covid 19 2.2. Group Discussion onmental health, Group Discussion impact of social media 2.3. Group Discussion onlives, pros and cons of technology 2.4. Students will be ableto present debate Debate on effectively on (Should the Use of Plastic Be Banned? Debate on: Should Parents Decide Which	1. Prepare 2. Prepare a Resume

		Career Their Children Will Pursue? 2.5. . Debate on: Is Artificial Intelligence Useful or Dangerous?) 2.6. Interviews and theirKinds Mock Interview Session 2.7. Resume Writing.	

OSSD02.3: Communicate effectively in Hindi and English languages without hindrances.

Approximate Hours

Item	Appx. Hrs.
Cl	6
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Students will be able to organize and prepare speeches. **SO3.2** Students will be ableto think and speak instantaneously. **SO3.3** To make them understand the inquiry procedure at public places. **SO3.4** To enable them tocommunicate effectively through phones.	.	**Unit-3: Public Speaking Skills& Conversational Skills** 3.1 Speech/Anchoring Speech/Anchoring on National Science Day 3.2 Valedictory Speech Patriotic speech 3.3 Extempore Extempore (Pros and Cons of Online teaching 3.4 Extempore : Environment Conservation and Extempore : Education of a Girl Child) 3.5 Conversational Topics (Inquiry at bank, Airport, Station and Hospitals). Telephonic Conversation(Describing about Your College Day to Your Parents from Hostel 3.6 Talking with Customer Care Executive of Any E-Commerce company).	1. Prepare a speech on the followingtopics. 2. Prepare on the following conversationaltopics.

OSSD02.4.4: Convey their messages accurately by understanding the significance of grammar as it plays avital role in improving speaking and writing skills.

Approximate Hours

Item	AppXHrs
Cl	6
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understanding about the use of Prepositions. **SO4.2**Students will be able to understand the usage of Tenses **SO4.3**Undesrtand the concept of Active and Passive Voice **SO4.4**To understand the usageof Modals		Unit-4: Functional Grammar and Vocabulary Building 4.1. Prepositions: Place 4.2. Time 4.3. Direction 4.4. Tenses: Present, Past, Future 4.5. Voice (Active and Passive) 4.6. Modals.	1. Prepare the Structure of Tenses and Active Passive. 2. Prepare 250 Vocabularies.

OSSD02.5.5: Understanding of The Indian Culture and English Language will be developed through thestudy of Dramas and Poems written by Indian Writers.

Approximate Hours

Item	Appx. Hrs.
Cl	5
LI	0
SW	1
SL	1
Total	7

Session Outcomes (SOs)	**Laboratory Instruction(LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**

SO5.1 Students will be able to understand the value of Indian Literature (R.K. Narayan) **SO5.2** Students will be able to understand the value of Indian Literature (Nissim Ezekiel) **SO5.3** Students will be able to understand the value of Indian Literature (Khushwant Singh) **SO5.4** Students will be able to understand the value of Indian Literature (Mulk Raj Anand) **SO5.5** Students will be able to understand the value of Indian Literature (Prem Chand)		**Unit 5-Indian Writing in English& Hindi** 5.1. The Axe- R.K. Narayan 5.2. The Night of the Scorpion- Nissim Ezekiel 5.3. The Portrait of a Lady -Khushwant Singh 5.4. The Lost Child- Mulk Raj Anand 5.5. The Shroud- Prem Chand	1. Prepare the summary of all the topics (The Axe, The Night of the Scorpion, The Portrait of a Lady,The Lost Child he Shroud).

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
OSSD02.1: Students will be speak confidently in public as all the topics chosen emphasis on improving speaking skills and developing self confidence amongst them.	6	1	1	13
OSSD02.2: Students will be interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand theImportance of Team Work.	7	1	1	14

OSSD02.3: Students will be communicate effectively in Hindi and English languages without hindrances.	6	1	1	13
OSSD02.4: Students will be convey their messages accurately by understanding the significance ofgrammar as it plays a vital role in improving speaking and writing Skills.	6	1	1	8
OSSD02.5: The Understanding of Indian Culture and English Language will be developed through the study of Dramas and Poems written by Indian Writers.	5	1	1	7
Total Hours	**30**	**5**	**5**	**55**

Suggested Specification Table (ForESA)

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. Roleplay
5. Presentations
6. Extempore
7. Speeches
8. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Communication Skills	Dr. Meenu Pandey	Nirali Prakashan.	2020
2	A Practical Guide to English Grammar	K.P. Thakur	Bharti Bhawan Publishers & Distributors.	2018
3	Living English Structure	W. Stannard Allen	Dorling Kindersley India Pvt. Ltd.	Fifth Edition,
4	Communication Skills for Engineers	Muralikrishna C., Sunita Mishra	Pearson, New Delhi.	Second edition (2010)
5.	Advanced Language Practice,	Michael Vince	Macmillan Education, Oxford	2003.
6.	English Conversation Practice	Grant Taylor	Tata McGraw Hill Education Private Limited.	1967

7.	Six Weeks to Words of Power	Wilfred Funk	W.R. Goyal Publishers and Distributors.	1990

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COs, POs and PSOs Mapping

Program Name: BCA
Course Code: OSSD02
Course Title: English Communication

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO.1: Students willbe able to speak confidently in public as all the topics chosen emphasis on improving speaking	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

skills and developing self confidence amongst them.																	
CO..2: Students will be able to interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand the Importance of Team Work.	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
CO.3: Students will be able to communicate effectively in Hindi and English languages without hindrances.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO.4: Students willbe able to conveytheir messagesaccurately by Understanding the Significance ofgrammar as it plays avital role in improving speakingand writing skills.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO.5: The Understanding ofIndian Culture andEnglish Language willbe developed through the study of Dramas and Poems written by Indian Writers.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Students will be able to speak confidently in public as all the topics chosen emphasis on improving speaking skills and developing self confidence amongst them.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1 Self-grooming, Basic Etiquettes andPresentation Skill 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Students will be able to interact properly with improved Leadership Skills, Problem Solving Skills, Social skills and Communication Skills. Students will also be able to understand the Importance of Team Work.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Confidence building skills, InterviewSkills and Resume Writing 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Students will be able to communicate effectively in Hindi and English languages without hindrances	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Public Speaking Skills& Conversational Skills 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10, 3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Students will be able to convey their messages accurately by understanding the significance of grammar as it plays a vital role in improving speaking and writing skills.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 Functional Grammar and Vocabulary Building 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10, 4.11,4.12,4.13,4.14	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: The Understanding of Indian Culture and English Language will be developed through the study of Dramas and Poems written by Indian Writers	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 **Indian Writing inEnglish& Hindi** Statistics 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10, 5.11,5.12,5.13,5.14,5.15	

AKS University

Faculty of Engineering and Technology

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Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-II

Course Code: 0IKS04

Course Title: Indian Knowledge System

Pre- requisite: Creating awareness among the youths about the true history and past rich culture of India.

Rationale: India has very rich and versatile knowledge system and cultural heritage since antiquity. The Indian Knowledge systems was developed on life science, medical science, literature, drama, art, music, dance, astronomy, mathematics, architecture (Sthapatyaveda), chemistry, aeronautics etc, during ancient period. In this basic course, a special attention is given to the ancient and historical perspective of ideas occurrence in the ancient society, and implication to the concept of material world and religious, social and cultural beliefs. On the closer examination, religion, culture and science have appeared epistemological very rigidly connected in the Indian Knowledge System. This land of Bharat Bhumi has provided invaluable knowledge stuff to the society and the world in all sphere of life.

Course Outcomes:

0IKS04.**1:** To understand the ancient civilization, Indian Knowledge Systems, Concept of Panch Mahabhuta, Origin of name Bharat Varsha, Ancient Rivers, Ancient Universities and ancient agriculture.

0IKS04.**2:** Have the ability to learn about ancient books, religious places, basic concept of Indian dance, music and arts, and fundamental aspects of Sangeeta and Natyashashtra etc.

0IKS04.**3:** To gain knowledge on Vedic Science, Astronomy, Astrovastu, Vedic Mathematics, Aeronautics, Metallurgy, Nakhatras,Panchang, Concept of Zero, Pi and point etc.

0IKS04.**4:** Understanding on ancient Engineering, Science and Technology, Town Planning, Temple architecture, Chemistry and Metallurgy, Metal manufacturing etc.

0IKS04.**5: U**nderstand about the Life, Nature and Health through basic concept of Ayurveda and Yoga, Traditional Medicinal Systems,Ethnomedicine, Nature conservation, World Heritage Sites etc.

Scheme of Studies:

Category of Course	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
Foundation	0IKS04	Indian Knowledge System	2	0	1	1	4	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Session Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Proposed examination scheme (Marking) as per the recommendation of University Grant Commission (UGC) for Under Graduate Courses in Fundamentals of Indian Knowledge Systems 2022-23 onwards

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Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Foundation	0IKS04	Indian Knowledge System	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1. To understand Indian Civilization and Indian Knowledge Systems

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 1.1. Understand Overview of Indian Knowledge Systems (IKS) SO 1.2. Understand Classification of Ancient IKS texts SO 1.3. Understand Introduction to Panch Mahabhutas (Earth, Water, Fire, Sky and Air)		**Unit-1. Indian Civilization and Indian Knowledge Systems** 1.1. Overview of Indian Knowledge Systems (IKS) 1.2 Classification of Ancient IKS texts	Golden era of ancient India

SO 1.4. Understand Origin of the name Bharatvarsha: the Land of Natural Endowments SO 1.5. Understand Rivers of ancient India (The Ganga, Yamuna, Godawari, Saraswati, Narmada, Sindhu and Kaveri) SO 1.6. Understand Ancient Agriculture and ancient Universities: Takshashila and Nalanda, Gurukul system		1.3 Introduction to Panch Mahabhutas (Earth, Water, Fire, Sky and Air) 1.4 Origin of the name Bharatvarsha: the Land of Natural Endowments 1.5 Rivers of ancient India (The Ganga, Yamuna, Godawari, Saraswati, Narmada, Sindhu and Kaveri) 1.6 Agriculture system in ancient India, Ancient Universities: Takshashila and Nalanda, Gurukul system.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Concepts of Panch Mahabhuta, Classification of ancient texts, origin of ancient rivers

b. Mini Project:

i. Ancient Universities: Takshashila and Nalanda,

c. Other Activities (Specify):

CO2: have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 2.1. Understand the Ancient Indian Books: Vedas, Puranas, Shastras, Upanishads, Mahakavyas (Ramayana & Mahabharata), Smrities, Samhitas SO 2.2. Understand the Religious places: Puries, Dhams, Jyotiralinga, Shaktipeeths, Kumbha Mela SO 2.3. Understand the Legendary places of Madhya Pradesh: Ujjain, Chitrakoot, Omkareshwar, Bharhut, Maihar SO 2.4. Understand the Basic concept of Indian Art, Music and Dance, Indian Musical Instruments		**Unit-2. Indian Art, Literature and Religious Places** 2.1.Ancient Indian Books: Vedas, Puranas, Shastras, Upanishads, Mahakavyas (Ramayana & Mahabharata),Smrities, Samhitas 2.2. Religious places: Puries, Dhams, Jyotiralinga, Shaktipeeths, Kumbha Mela 2.3.Legendary places of Madhya Pradesh: Ujjain, Chitrakoot, Omkareshwar, Bharhut, Maihar 2.4.Basic concept of Indian Art, Music and Dance, Indian Musical Instruments	**1.** Indian Art, Music and Dance

SO 2.5. Understand the Fundamental aspects of Sangeeta and Natya shastra SO 2.6. Understand the different schools of music, dance and painting in different regions of India.		2.5. Fundamental aspects of Sangeeta and Natya shastra 2.6. Different schools of music, dance and painting in different regions of India	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Visit of Chitrakoot, Maihar and Bharhuta

b. Mini Project:

ii. Kumbhmela, Story of Ramayana and Mahabharata

c. Other Activities (Specify):

CO3: Student will be able to understand Ancient Science, Astronomy and Vedic Mathematics

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 3.1. Understand Vedic Cosmology SO 3.2. Understand the Astronomy, Astrovastu, Vedang Jyotish, Nakshatras, Navagraha, Rashis, Vastushastra and their related plants SO 3.3. Understand the Time and Calendar, Panchang SO 3.4. Understand the Concept of Zero, Point, Pi -number system, Pythagoras SO 3.5. Understand the Vedic Mathematics, Vimana-Aeronautics, Basic idea of planetary model of Aryabhatta SO 3.6. Understand the Varanamala of Hindi language based on classification of sounds on the basis of their origin, Basic purpose of science of Vyakarana.		**Unit-3. Ancient Science, Astronomy, Mathematics** 3.1. Vedic Cosmology 3.2. Astronomy, Astrovastu, Vedang Jyotish, Nakshatras, Navagraha, Rashis, Vastushastra and their related plants 3.3. Time and Calendar, Panchang 3.4. Concept of Zero, Point, Pi -number system, Pythagoras 3.5. Vedic Mathematics, Vimana-Aeronautics, Basic idea of planetary model of Aryabhatta 3.6. Varanamala of Hindi language based on classification of sounds on the basis of their origin, Basic purpose of science of Vyakarana.	1. Ancient Science, Astronomy and Vedic Mathematics

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Varanamala of Hindi language based on classification of sounds on the basis of their origin

b. Mini Project:

1. Nakshatras, Navagraha and their related plants

c. Other Activities (Specify):

CO4: Understand the Engineering, Technology and Architecture

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 4.1. Understand the Engineering Science and Technology in Vedic and Post Vedic Era SO 4.2. Understand the Town and Home planning, Sthapatyaveda SO 4.3. Understand the Chemistry and Metallurgy as gleaned from archeological artifacts SO 4.4. Understand the Chemistry of Dyes, Pigments used in Paintings, Fabrics, Potteries and Glass SO 4.5. Understand the Temple Architecture: Khajuraho, Sanchi Stupa, Chonsath Yogini temple SO 4.6. Understand the Mining and manufacture in India of Iron, Copper, Gold from ancient times		**Unit-4. Engineering, Technology and Architecture** 4.1. Engineering Science and Technology in Vedic and Post Vedic Era 4.2. Town and Home planning, Sthapatyaveda 4.3. Chemistry and Metallurgy as gleaned from archeological artifacts 4.4 Chemistry of Dyes, Pigments used in Paintings, Fabrics, Potteries and Glass 4.5. Temple Architecture: Khajuraho, Sanchi Stupa, Chonsath Yogini temple 4.6. Mining and manufacture in India of Iron, Copper, Gold from ancient times.	2. Ancient Science, Astronomy and Vedic Mathematics

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Varanamala of Hindi language based on classification of sounds on the basis of their origin

b. Mini Project:

i. Nakshatras, Navagraha and their related plants

c. Other Activities (Specify):

CO5: Understand about the Life, Nature and Health

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**0**
SW	**2**
SL	**1**
Total	**9**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 5.1. Understand the Fundamentals of Ayurveda (Charaka & Shushruta) and Yogic Science (Patanjali), Ritucharya and Dinacharya SO 5.2. Understand the Traditional system of Indian medicines (Ayurveda, Siddha, Unani and Homoeopathy) SO 5.3. Understand Fundamentals of Ethnobotany and Ethnomedicines of India SO 5.4. Understand the Nature Conservation in Indian ancient texts SO 5.5. Understand the Introduction to Plant Science in Vrikshayurveda SO 5.6. Understand the World Heritage Sites of Madhya Pradesh: Bhimbetka, Sanchi, Khajuraho		**Unit-5. Life, Nature and Health** 5.1. Fundamentals of Ayurveda (Charaka & Shushruta) and Yogic Science (Patanjali), Ritucharya and Dinacharya 5.2. Traditional system of Indian medicines (Ayurveda, Siddha, Unani and Homoeopathy) 5.3. Fundamentals of Ethnobotany and Ethnomedicines of India 5.4. Nature Conservation in Indian ancient texts 5.5 Introduction to Plant Science in Vrikshayurveda 5.6. World Heritage Sites of Madhya Pradesh: Bhimbetka, Sanchi, Khajuraho.	1. Concept of Ayurveda and Yoga 2. Traditional system of Indian medicines 3. Ethnobotany and Ethnomedicines of India 4. World Heritage Sites

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Visit to world Heritage Site Khajuraho

b. Mini Project:

i. Ritucharya and Dincharya, Ethnomedicinal plants

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: To understand Indian Civilization and Indian Knowledge Systems	**6**	**2**	**1**	**9**
CO2: Students will have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places	**6**	**2**	**1**	**9**
CO3: Student will be able to understand the Ancient Science, Astronomy and Vedic Mathematics	**6**	**2**	**1**	**9**
CO4: Understand the Engineering, Technology and Architecture	**6**	**2**	**1**	**9**
CO5: Understand about the Life, Nature and Health	**6**	**2**	**1**	**9**
Total	**30**	**10**	**5**	**45**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Indian Civilization and Indian Knowledge Systems	**2**	**5**	**1**	**8**
CO 2	Indian Art, Literature and Religious Places	**2**	**6**	**2**	**8**
CO 3	Ancient Science, Astronomy and Vedic Mathematics	**2**	**6**	**5**	**13**
CO 4	Engineering, Technology and Architecture	**2**	**4**	**4**	**10**
CO 5	Life, Nature and Health	**2**	**5**	**2**	**9**
Total		**10**	**26**	**14**	**50**

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Indian Knowledge Systems** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course teacher for above tasks. Teacher can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Religious places, World Heritage Sites
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	*An Introduction of Indian Knowledge Systems: Concept and Applications*	Mahadevan, B.; Bhat V. R. and Pavana, Nagendra R. N.	Prentice Hall of India.	2022
2	*Indian Knowledge Systems*: Vol. I and II.	Kapoor, Kapil and Singh, A. K.	D.K. Print World Ltd	2005
3	*Science of Ancient Hindus: Unlocking Nature in Pursuit of Salvation*	Kumar, Alok	Create pace Independent Publishing	2014
4	*A History of Agriculture in India*	Randhava, M.S.	ICAR, New Delhi	1980
5	*Panch Mahabhuta*,	Yogcharya, Jnan Dev	Yog Satsang Ashram	2021
6	*The Indian Rivers*	Singh, Dhruv Sen	Springer	2018
7	*The Wonder That Was India*	Basam, Arthue Llewllyn	Sidgwick & Jackson	1954
8	*Ancient Cities, Sacred Skies: Cosmic Geometries and City Planning in Ancient India*	Malville, J. MacKim & Gujaral, Lalit M.	IGNCA & Aryan Books International, New Delhi	2000
9	*The Natya Shastra of Bharat Muni*	Jha, Narendra	Innovative Imprint, Delhi	2023

10	*Astronomy in India: A Historical Perspective*	Padmanabhan, Thanu	Indian National Science Academy, New Delhi & Springer (India).	2010
11	*History of Astronomy in India* 2nd Ed.	Sen, S.N. and Shukla, K.S.	INSA New Delhi	2001
12	*History of Indian Astronomy A Handbook*	Ramasubramanian, K.; Sule, Aniket and Vahia, Mayank	Science and Heritage Initiative, I.I.T. Mumbai and Tata Institute of Fundamental Research, Mumbai	2016
13	*Indian Mathematics and Astronomy: Some Landmarks*	Rao, Balachandra S.	Jnana Deep Publications, Bangalore, 3rd Edition	. 2004
14	*Vedic Mathematics and Science in Vedas*	Rao, Balachandra S.	Navakarnataka Publications, Bengaluru	2019
15	*A History of Hindu Chemistry*	Ray, Acharya Prafulla Chandra	Repbl Shaibya Prakashan Bibhag, Centenary Edition, Kolkata	1902
16	*Early Indian Architecture: Cities and City Gates*	Coomeraswamy, Anand	Munciram Manoharlal Publishers	2002
17	*Theory and Practices of Temple Architecture in Medieval India: Bhojas samrangasutradhar and the Bhojpur Line Drawings*	Hardy, Adams	Dev Publishers & Distributors.	2015
18	*Indian Science and Technology in Eighteenth Century*	Dharmpal	Academy of Gandhian Studies, Hyderabad.	1971
19	*Science in India: A Historical Perspective*	Subbarayappa, B.V.	Rupa New Delhi	2013
20	*Fine Arts & Technical Sciences in Ancient India with special reference to Someswvara's Manasollasa*	Mishra, Shiv Shankar	Krishnadas Academy, Varanasi	1982
21	*Fundamental Principles of Ayurveda*, Volume One	Lad, Vasant D.	The Ayurvedic Press, Alboquerque, New Mexico.	2002
22	*Charak Samhita*, Chaukhamba	Pandey, Kashinath and Chaturvedi Gorakhnath	Vidya Bhawan, Varanasi	
23	*Ayurveda: The Science of Self-Healing*	Lad, Vasant D.	Lotus Press: Santa Fe	1984
24	*Ayurveda: Life, Health and Longevit*	Svoboda, Robert E	Penguin: London	1992
25	*Plants in the Indian Puranas*	Sensarma, P.	Naya Prokash, Calcutta	1989
26	*Indian Cultural Heritage Perspective for Tourism*	Singh, L. K.	Gyan Publishing House, Delhi	2008
27	*Glimpses of Indian Ethnobotany*	Jain, S.K.	Oxford & IBH Publishing Company Private Limited, New Delhi	1981
28	Manual of Ethnobotany	Jain, S.K.	Scientific Publishers, Jodhpur	2010

AKS University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

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CO, PO and PSO Mapping

Program: BCA
Course Code : 0IKS04
Course Title: IKS

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
	Engineering knowledge	Problem Analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science

KS. 1: To understand Indian Civilization and Indian Knowledge Systems	2	2	3	1	1	1	1	1	1	1	1	2	2	2	2	2
IKS. 2: Students will have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places	2	3	2	1	2	2	1	1	1	1	1	1	3	2	3	2
IKS. 3: Student will be able to understand the Ancient Science, Astronomy and Vedic Mathematics	2	2	2	2	2	2	1	1	1	1	1	2	1	2	1	2
IKS. 4: Understand the Engineering, Technology and Architecture	3	2	3	3	2	3	1	2	2	1	2	3	3	3	2	1
KS. 5: Understand about the Life, Nature and Health	3	2	3	2	3	2	1	2	1	1	2	3	2	3	2	1

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**IKS. 1:** To understand Indian Civilization and Indian Knowledge Systems	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		**Unit-1. Indian Civilization and Indian Knowledge Systems** 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number Above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**IKS. 2:** Students will have the ability to apply the knowledge gained about Indian Art, Literature and Religious Places	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6		**Unit-2. Indian Art, Literature and Religious Places** 2.1, 2.2, 2.3, 2.4, 2.5,2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**IKS. 3:** Student will be able to understand the Ancient Science, Astronomy and Vedic Mathematics	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6		**Unit-3. Ancient Science, Astronomy, Mathematics** 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**IKS. 4:** Understand the Engineering, Technology and Architecture	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6		**Unit-4. Engineering, Technology and Architecture** 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**IKS. 5:** Understand about the Life, Nature and Health	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6		**Unit-5. Life, Nature and Health** 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

Semester-II

Course Code: **01CA211**
Course Title : Programming Methodology & Data Structures

Pre-requisite: Student should have basic knowledge of components and architecture of digital computersystem
Rationale: The students should possess foundational understanding about the basic components of digital Computer system. This encompasses familiarity with the operational elements of digital computer system. Additionally, Students ought to acquire fundamental insights into different types of computers, their applications.

Course Outcomes:

01CA211.1: .Develop simple algorithms and flow charts to solve a problem with Programming using top down design principles
01CA211.2: Writing efficient and well-structured computer algorithms/Programs. Learn to formulate iterative solutions and arrayprocessing algorithms for problems.
01CA211.3: Implement and know the applications of algorithms searching and sorting
01CA211.4: Use recursive techniques, pointers and searching methods in Programming
01CA211.5: Know the contributions of Indians in the field of Programming and data structures.

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credit (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Major	01CA211	Programming Methodology & Data Structure	4	4	2	1	11	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Major	01CA211	Programming Methodology & Data Structure	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Major	ES104	Programming for Problem Solving	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

01CA211.**1:** .Develop simple algorithms and flow charts to solve a problem with Programming using top down design principles

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Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	12
SW	2
SL	1
Total	28

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction(CI)**	**Self-Learning (SL)**
O1.1 Define a Introduction to Programming **SO1.2** Explain Basics of C++ **SO1.3** Explain Functions inC++ **SO1.4** Discuss Memory Management Operators **SO1.**5 **Explain** Type CastOperator . .	1. Write a **Program** toswap the contents of two variables 2. Write a **Program**for finding the roots of a Quadratic Equation. 3. Write a Programto find area of a circle, 4. Write a Programto find area of rectangle,square using switch case 5. Write a **Program**to print table of any number 6. Write a **Program**to print Fibonacciseries.	**Unit-1. Introduction to Programming (13 Lectures)** 1.1 Program Concept, Characteristics of Programming, 1.2 Stages in Program Development 1.3 Algorithms, Notations, Design Flowcharts. 1.4 Type of Programming Methodologies. 1.5 A Brief History of C++, Application of C++ Compiling & Linking. 1.6 Tokens, Keywords, Identifiers & Constants 1.7 Basic Data Types, User-Defined Data Types, Symbolic Constant, 1.8 Compatibility, Reference Variables, Operator in C++, Scope Resolution Operator 1.9 Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operator. 1.10 The Main Function, Function Prototyping 1.11 Call by Reference Call by Address, Call by Value, 1.12 Return by Reference, Inline Function 1.13 Default Arguments, Constant Arguments, Function Overloading Function with Array.	1. Study about Call by Reference Call by Address, Call by Value, Return by Reference

SW-1Suggested Sessional Work (SW):

a. Assignments:

(i) Discuss about Function Overloading Function with Array.

b. Presentation

c. Pictorial representation on Function Prototyping.

01CA211.2: Writing efficient and well-structured computer algorithms/Programs. Learn to formulate iterative solutions andarray processing algorithms for problems.

Approximate Hours

Item	Appx. Hrs.
Cl	15
LI	12
SW	2
SL	1
Total	30

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**		**Self-Learning (SL)**
SO2.1 To Understand the basic Classes & Objects **SO2.2**To learn Memory Allocation for Objects **SO2.3**To understand Constructor & Destructor. **SO2.4** discuss about Inheritance. **SO2.5** discuss about Polymorphism.	1. Write a Program to find factorial of a given number using recursion 2. Write a Program to convert decimal (integer) number into equivalent binary number. 3. Write a Program to check given string is palindrome or not 4. Write a Program to print digits of entered number in reverse order. 5. Write a **Program** to print sum of two matrices 6. Write a **Program** to print multiplication of two matrices.	Unit-2 **Classes & Objects (11 Lectures)** 2.1 A Sample C++ Program with Class Defining Member Making an Outside Function Inline 2.3 Nesting of Member Functions, Private Member Functions. 2.4 Arrays within a Class, Memory Allocation for Objects 2.5 Static Data Members, Static Member, Functions, 2.6 Object as Function Arguments, Friend Functions Array of Objects, 2.7 Virtual functions, Returning Objects, Constant member functions, Pointer to Members, Local Classes . 2.8 Constructor, Parameterized Constructor, Multiple Constructors in a Class, and Constructors with Default Argument		1. Learn about Nesting of Member Functions.

		2.9 Dynamic Initialization of Objects, Copy Constructor 2.10 Dynamic Constructor and Destructor. 2.11 Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable 2.12 Multilevel Inheritance, Hierarchical Inheritance, Multiple Inheritance, Hybrid Inheritance 2.13 Virtual Base Classes Abstract Classes, Constructor in Derived Classes 2.14 Polymorphism, Pointers, Pointers with Arrays C++, Stream. 2.15 C++ Stream Classes, Unformatted V/O Operation, Formatted I/O Operation, Managing Output with Manipulators, Exception Handling.		

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Dynamic Initialization of Multilevel Inheritance, Hierarchical Inheritance, Multiple Inheritance.

b. Presentation

c. Pictorial representation of Destructor:

01CA211.3: Implement and know the applications of algorithms searching and sorting

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	12
SW	2
SL	1
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Overview of Basic concepts, Linear and Non-Linear data structures **SO3.2** to understand Arrays **SO3.3** to understand the linked representations. **SO3.4** know about Queues **SO3.5** Linked Lists	1. Write a **Program** to generate even/odd me from 1 to 100. 2. Writes Program whether a given number is prime or not. 3. Write a Program for call by value and call by reference. 4. Write a Program to create a pyramid structure 1 12 123 1234 5. Write a **Program** to check entered number is Armstrong or not. 6. WAP for Array	**Unit-3:BASIC COMPUTER ORGANIZATION:** 3.1 Algorithm Specification: Introduction, Recursive algorithms, 3.2 Data Abstraction, Performance anaIysis, 3.3 Representation of single, two-dimensional arrays, triangular sparse matrices-array 3.4 linked representations.Stacks: Operations, Array and Linked Implementations. 3.5 Applications- Infix to Postfix Conversion, Infix to Prefix Conversion, Postfix Expression Evaluation, Recursion Implementation. 3.6 Definition, Operations, Array and Linked Implementations, 3.7 Circular Queue-Insertion and Deletion Operations 3.8 Dequeue (Double Ended Queue), Priority Queue- Implementation 3.9 Singly Linked Lists, Operations, Concatenating, circularly linked lists-Operations for Circularly linked lists 3.10 Doubly Linked Lists- Operations, Doubly Circular Linked List, Header Linked List	**i.** Applications- Infix to Postfix Conversion, Infix to Prefix Conversion **ii.** circularly linked lists-Operations for Circularly linked list,

SW-3 Suggested Seasonal Work (SW):

- **a. Assignments:**
  - **(i) Explain Array and Linked Implementations**
- **b. Presentation**
- **c. Pictorial representation of triangular sparse matrices-array and linked representations Stacks:**

01CA211.4: Use recursive techniques, pointers and searching methods in Programming

Approximate Hours

Item	Appx. Hrs.
Cl	17
LI	12
SW	2
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Explain : Representation of Trees **SO4.2 To u**nderstand **Heap** **SO4.3 Explain** Auxiliary memory **SO4.4 Explain** , Graph Representations **SO4.**5 Explain Sorting and hashing.	1. Write a **Program** to input N numbers and find their average. 2. Write a **Program** to find the area and volume of a rectangular box using constructor 3. Write a **Program** to implement single inheritance. 4. Write a **Program** to find largest element from an array 5. Write a **Program** to implement push and pop operations on a stack using array. 6. Example of graph	4.1 Unit-4 : MEMORY SYSTEM: 4.2 (12 Lectures) 4.3 Representation of Trees, Binary tree, Properties of Binary Trees 4.4 Binary Tree Representations-Array and Linked Representation. 4.5 Binary Tree Traversals. ' 4.6 Threaded Binary Trees. 4.7 Heap Definition Insertion, Deletion. 4.8 Graph ADT, Graph Representations, 4.9 Graph Traversals, Searching 4.10 Sorting Bouble sort, Selection sort, 4.11 Quick sort, 4.12 Merge sort, 4.13 Comparison of Sorting Methods. 4.14 Search Tress: Binary search Trees, AVL Trees- Definition and Examples. 4.15 Hashing Introduction, HASH tables, 4.16 Hash functions 4.17 Overflow Handling.	**i.** Graph ADT, Graph Representations, Graph Traversals **ii.** Priority Queue-Implementation

SW-4 Suggested Sessional Work (SW):

Assignments: a.

(i) Explain Binary tree, Properties of Binary Trees .

(ii) Discuss Comparison of Sorting Methods.

b. Presentation

c. Pictorial representation of Binary Tree Traversals01CA211.5: The student will compare Indian

Contribution to the field

Item	Appx. Hrs
Cl	5
LI	12
SW	2
SL	1
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understand Indian Contribution to the field **SO5.2 Explain** new Programming languages	1. Write a **Program** for Linear search. 2. Write a **Program** for Binary search. 3. Write a **Program** for Bubble sort. 4. Write a **Program** for Selection sort. 5. Write a **Program** for Quick sort. 6. Write a **Program** for Insertion sort.	Unit5: 5.2 Indian Contribution: 5.1 (5 Lecture) 5.2 Indian Contribution to the field: Innovations in India, origin of Julia Programming Language 5.3 Indian Engineers who designed new Programming languages 5.4 open-source languages, Dr. Sartaj Sahni computer scientist pioneer of data structures. 5.5 Other relevant contributors and contributions.	1.Indian Contribution to the field

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Explain Write a Program to design a Class time with hours, minutes and seconds as data members. Use a data function to perform the addition of two-time objects in hours, minutes and seconds.

b. Presentation:

c. Other Activities (Specify): Group discussion on important topics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction(LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: .Develop simple algorithms and flow charts to solve a problem with Programming using top down design principles	13	12	2	1	28
CO2 Writing efficient and well-structured computer algorithms/Programs. Learn to formulate iterative solutionsand array processing algorithms for problems.	15	12	2	1	30
CO3 Implement and know the applications of algorithms searching and sorting	10	12	2	**1**	25
CO4 Use recursive techniques, pointers and searching methods in Programming	17	12	2	1	32
CO5 Know the contributions of Indians in the field of Programming and data structures.	5	12	2	1	20
Total Hour	60	60	10	5	135

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	Unit-1	03	02	03	08
CO-2	Unit-2	03	01	05	09
CO-3	Unit-3	03	07	02	12
CO-4	Unit-4	03	05	05	13
CO-5	Unit-5	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for autonomous system for AI and DS will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different

tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources: Books:

S. No.	Title	Author	Publisher	Edition & Year
1	"Data Structures and algorithm in C++".	Adam Drozdek		
2	Data Structure using C++, Second edition	DS Malik		
3	Data structures and Algorithm Analysis in C", 2nd edition	M. A. Weiss		

A. Alternative NPTEL/SWAYAM/MOOC Course (if any): NA

Curriculum Development Team

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COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 01CA211
Course Title: Programming Methodology

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: .Develop simple algorithms and flow charts to solve a problem with Programming using top down design principles	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

CO2: Writing efficient and well-structured computer algorithms/Programs.Learn to formulate iterative solutions and array processing algorithms for problems.	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
CO3: Implement and know the applications of algorithms searching and sorting	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO4 : Use recursive techniques, pointers and searching methods in Programming	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO5: Know the contributions of Indians in the field of Programming and data structures.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1:** .Develop simple algorithms and flow charts to solve a problem with Programming using top down design principles	SO1.1 SO1.2 SO1.3 SO1.4		UNIT –I 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2:** Writing efficient and well-structured computer algorithms/Programs.Learn to formulate iterative solutions and array processing algorithms for problems.	SO2.1 SO2.2 SO2.3 SO2.4		UNIT – II 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3:** Implement and know the applications of algorithms searching and sorting	SO3.1 SO3.2 SO3.3 SO3.4		UNIT – III: 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4** : Use recursive techniques, pointers and searching methods in Programming	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4:.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5:** Know the contributions of Indians in the field of Programming and data structures.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5: 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	

AKS University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revisedason01August2023)

Semester-II

Course Code: **03MS231**

Course Title: Numerical Method

Pre- requisite: Higher knowledge of mathematics.

Rationale: The aim of the course is to introduce to the field of mathematics with emphasis on its use to solve real world problems for which solutions are difficult to express using the different methods. It explores the essential theory and m e t h o d s for developing systems that demonstrate intelligent behavior including dealing with uncertainty, learning from experience and following problem-solving strategies found in nature.

Course Outcomes:

03MS231.1: Understand numerical methods to find the solution of a system of linear equations.

03MS231.2: Compute interpolation value for real data.

03MS231.3: Find quadrature by using various numerical methods.

03MS231.4: Solve system of linear equations by using various numerical techniques.

03MS231: Obtain solutions of ordinary differential equations by using numerical methods.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Open Elective	03MS231	Numerical method	4	0	1	1	6	4

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Session Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

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Scheme of Assessment: Theory

Board of Study	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks (PRA+ESA)
			Class/Home Assignment5 number 3 marks each	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	
OE	03MS231	Numerical method	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

03MS231.1: Understand numerical methods to find the solution of a system of linear equations.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the concept of Algebraic Equation **SO1.2** uses of Bisection method **SO1.3** Uses of Ramanuja n Method.	.	**Unit-1.0** Methods for Solving Algebraic and Transcendental Equations 1.1 Bisection Method-1 1.2 Bisection Method-2 1.3 Examples of Bisection Method 1.4 Regular Falsi Method 1.5 Example of Regular Falsi Method 1.6 Secant Method-1 1.7 Secant Method-2 1.8 Examples of Secant Method 1.9 Newton-Raphson Method-1 1.10 Newton-Raphson Method-2 1.11 Examples of Newton- Raphson Method Ramanujan Method	1. Solve related examples of different methods

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Concepts of Panch Mahabhuta, Classification of ancient texts, origin of ancient rivers

b. Mini Project:

i. Ancient Universities: Takshashila and Nalanda,

c. Other Activities (Specify):

03MS231.2: Compute interpolation value for real data.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the concept of interpolation **SO2.2** Understand the concept of differences	.	**Unit-2.0** Interpolation 2.1. Lagrange interpolation 2.2. Example of Lagrange interpolation 2.3. Finite difference operators. 2.4. Examples of finite	1. Solve related examples of different method
		differences table 2.5. Interpolation formula 2.6. Newton Forward Difference 2.7. Examples of Newton forward 2.8. Newton Backward Difference 2.9 Examples of newton backward.	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on Lagrange interpolation.
ii. Numerical based on Newton Forward Difference.
iii. Examples of Finite difference operators.

03MS231.3: Find quadrature by using various numerical methods.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the concept of Numerical integration **SO3.2** Understand the concept of Trapezoidal rule **SO3.3** Understand the concept of Simpsons rule	.	**Unit-3.0** Numerical Integration 3.1. Newton- Cote's formulae. 3.2. Trapezoidal rule 3.3. Examples of Trapezoidal rule 3.4. Simpson's 1/3 rule 3.5. Examples of Simpson's 1/3 rule 3.6. Simpson's 3/8 rule 3.7. Example of Simpson's 3/8 rule. 3.8. Gauss Integration 3.9. Example of gauss integration	1. Writes examples of Newton-Cote's formulae 2. Writes examples of gauss integration

SW-1 Suggested Sessional Work (SW):**Assignments:**

i. Numerical based on Newton- Cote's formulae

ii. Writes related examples of Trapezoidal rule.

03MS231.4: Solve system of linear equations by using various numerical techniques.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the concept of Linear equation **SO4.2** Understand the concept of Gauss elimination method **SO4.3** Understand the concept of Iterative method	.	**Unit-4.0** Methods to Solve System of Linear Equations 4.1. Gauss elimination 4.2. LU decomposition 4.3. Iterative method 4.4. Gauss Jacobi method 4.5. Examples of gauss Jacobi method 4.6. Gauss seidal method 4.7. Examples of gauss seidal method 4.8. Example of gauss elimination method 4.9. Cholesky decomposition method.	1. Direct method for solving system of linear equations

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Questions based on Gauss elimination method.
ii. Questions based on LU decomposition method.
iii. Questions based on Cholesky decomposition method.

03MS231.5: Obtain solutions of ordinary differential equations by using numerical methods

Approximate Hours

Item	AppX Hrs
Cl	09
LI	00
SW	02
SL	01
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand the concept of Single step methods **SO5.2** Understand the concept of Multistep methods	.	**Unit-5.0** Numerical Solution of Ordinary Differential Equations 5.1. Single step methods 5.2. Picard's Method 5.3. Taylor's Series 5.4. Euler's ethod 5.5. Runge-Kutta Method 5.6. Multistep methods 5.7. Predictor-corrector 5.8. Modified Euler 5.9. Milne-Simpson	**1.** Writes Uses of Single step methods.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Different types of Single step methods.

ii. Question based on Multistep methods.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
03MS231.1: Understand numerical methods to findthe solution of a system of linear equations.	09	02	01	12
03MS231.2: Compute interpolation value for realdata.	09	02	01	12

03MS231.3: Find quadrature by using variousnumerical methods.	09	02	01	12
03MS231.4: Solve system of linear equations byusing various numerical techniques.	09	02	01	12
03MS231.5: Obtain solutions of ordinary Differential equations by using numericalmethods.	09	02	01	12
Total Hours	45	10	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Methods for Solving Algebraic and Transcendental Equations	03	02	03	08
CO-2	Interpolation	03	01	05	09
CO-3	Numerical Integration	03	07	02	12
CO-4	Methods to Solve System of Linear Equations	03	05	05	13
CO-5	Numerical Solution of Ordinary Differential Equations	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply
The end of semester assessment for **Indian Knowledge Systems** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course teacher for above tasks. Teacher can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Religious places, World Heritage Sites
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Introductory Methods of Numerical Analysis,	S. S. Sastry	Prentice Hall India Learning Private	Flfth edition, 2012
2	Numerical Methods.	E. Balagurusamy	Tata McGraw Hill Publication	2017
3	Numerical Method for Scientific and Engineering Computation	M. K. Jain, S. R. K. lyengar, R. K. Jain	New Age International (P) Ltd	1999
4.	Finite Differences & Numerical Analysis	Saxena H. C.	S Chand	2010

AKS University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revisedason01August2023)

Curriculum Development Team

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CO, PO and PSO Mapping

Program: BCA
Course Code: 03MS231
Course Title: Numerical Method

	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Course Outcomes	Engineering knowledge	Problem Analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science

CO 101.1: Understand numerical methods to find the solution of a system of linear equations.	2	2	3	1	1	1	1	1	1	1	1	2	2	2	2	2
CO 101.2: Compute interpolation value for real data.	2	3	2	1	2	2	1	1	1	1	1	1	3	2	3	2
CO 101.3: Find quadrature by using various numerical methods.	2	2	2	2	2	2	1	1	1	1	1	2	1	2	1	2
CO 101.4: Solve system of linear equations by using various numerical techniques.	3	2	3	3	2	3	1	2	2	1	2	3	3	3	2	1
CO 1015: Obtain solutions of ordinary differential equations by using numerical methods.	3	2	3	2	3	2	1	2	1	1	2	3	2	3	2	1

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 101.1: Understand numerical methods to find the solution of a system of linear equations.**	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		**Unit-1** **Methods for Solving Algebraic and Transcendental Equations** 2.1, 2.2, 2.3, 2.4, 2.5,2.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 101.2: Compute interpolation value for real data.**	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6		**Unit-2 Interpolation** 2.1, 2.2, 2.3, 2.4, 2.5,2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 101.3: Find quadrature by using various numerical methods.**	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6		**Unit-3 : Numerical Integration** 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 101.4: Solve system of linear equations by using various numerical techniques.**	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6		**Unit-4 :** **Methods to Solve System of Linear Equations** 4.1,4.2,4.3,4.4,4.5,4.6,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**IKS. 5:** Understand about the Life, Nature and Health	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit5: **Numerical Solution of Ordinary Differential Equations** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of BCA

(Revised as on 01 August 2023)

Semester-II

Course Code: **02CA221**

Course Title: Operating System

Pre-requisite: Student should have a basic understanding of Fundamental of Computer.

Rationale: Study of Operating System helps students to learn the importance of computer system resources and the role of operating system in their management policies and algorithms as well as the evolution of Operating Systems. Students will understand various process management concepts and can compare various scheduling techniques, synchronization, and deadlocks, memory management and file management.

Course Outcomes:

02CA221.1: Specify objectives of modern operating systems and describe how operating systems have evolved over time.

02CA221.2: Understand various process management concepts and can compare various scheduling techniques, synchronization, and deadlocks. Also identify the best suited process management technique for any process.

02CA221.3: Understand the concepts of memory management techniques and file management.

02CA221.4: Understand the concepts of disk management. Understand and identify potential threats to Operating systems and the security features to guard against them.

02CA221.5: Understand and operate the Linux system as well as the contribution of Indians in the field.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Minor	02CA 221	Operating System	4	4	1	1	10	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecture(L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

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Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA +CAT+AT)		
Minor	02CA221	Operating System	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Minor	ES104	Operating System lab	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

A K S University

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02CA221.1: Specify objectives of modern operating systems and describe how operating systems have evolved over time.

Approximate Hours

Item	Appx. Hrs.
CI	13
LI	12
SW	1
SL	1
Total	27

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand OperatingSystem **SO1.2** Understand basic functionsof Operating System **SO1.3** Resource Abstraction. **SO1.4** Understand Batch Systems,Multi-Programming Systems. **SO1.5** Understand Multiprocessing Systems, Time Sharing Systems **SO1.6** Understand Distributed OS, Real time systems **SO1.7** Learn about Operating System for Personal Computers. **SO1.8** Learn about Operating System for Workstations. **SO1.9** Learn about Operating System for Hand-held Devices. **SO1.10** Understand use of Operating System in real world. **SO1.11** Learn about commonly used Operating systems - Windows, MacOS. **SO1.12** Learn about commonly used Operating systems - UNIX/Linux **SO1.13** Learn about commonly used Operating systems - Android,IOS, Blackberry OS, Symbian, Bada etc.	1. How to install Linux. 2. Linux Directory Commands: pwd, mkdir, 3. Linux Directory Commands rm -rf, ls, 4. Linux Directory Commands cd,cd /,cd~ 5. Linux File Commands: touch, cat, cal >, cat >>, 6. Linux Directory Commands rm, cp, mv, rename	**Unit-1.0 Introduction** 1.1 Introduction to Operating System: What is Operating System? History and Evolution of OS. 1.2 Basic OS functions 1.3 Resource Abstraction. Types of OperatingSystems— Batch Systems,Multi-Programming Systems. 1.5 Types of Operating Systems— Multiprocessing Systems, Time Sharing Systems 1.6 Types of Operating Systems— Distributed OS, Real time systems. 1.7 Operating System for Personal Computers 1.8 Operating System for Workstations 1.9 Operating System for Hand-held Devices. 1.10 Applications of various operating system in real world. 1.11 Some prevalent operating systems — Windows, MacOS 1.12 Some prevalent operating systems — UNIX/Linux. 1.13 Some prevalent operating systems — Android, IOS, Blackberry OS, Symbian, Bada etc	1. Learn Basics of Computer Fundamental.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. What is an Operating System? Describe its functions.
2. Write short notes on Types of Operating Systems— Batch Systems, Multi-Programming Systems, Multiprocessing Systems, Time Sharing Systems, Distributed OS, Real time systems.

b. Mini Project:
NA

c. Other Activities (Specify):NA

02CA221.2: Understand various process management concepts and can compare various scheduling techniques, synchronization, and deadlocks. Also identify the best suited process management technique for any process.

Approximate Hours

Item	Appx. Hrs.
CI	13
LI	12
SW	1
SL	1
Total	27

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the basic concepts of Processes. **SO2.2** Understand Process States and Process Control Block **SO2.3** Understand scheduling, it's types and it's need. **SO2.4** Understand FCFS Scheduling Algorithm. **SO2.5** Understand SJF Scheduling Algorithm. **SO2.6** Understand SRTN Scheduling Algorithm. **SO2.7** Understand RR Scheduling Algorithm. **SO2.8** Understand Priority-based Scheduling Algorithm. **SO2.9** Learn Multiple-Processor, Real-Time. **SO2.10** Learn Multilevel Queue and Multilevel Feedback Queue Scheduling. **SO2.11** Understand basic concepts of Deadlock. **SO2.12** Learn Prevention, and Avoidance of Deadlock. **SO2.13** Learn Detection and recovery from Deadlock.	1 Linux Permission Commands: su,id, 2 Linux Permission Commands useradd, passwd, 3 Linux Permission Commands: groupadd, chmod, 4 Linux Permission Commands groupdel, chown, chgrp 5 Linux File Content Commands: head, tail, 6 Linux File Content Commands tac,more, less,	**Unit-2.0 Process Management** 2.1 Process concepts 2.2 Process States and Process Control Block 2.3 Process Scheduling (Preemptive and Non-preemptive) 2.4 FCFS Scheduling Algorithm 2.5 SJF Scheduling Algorithm 2.6 SRTN Scheduling Algorithm 2.7 RR Scheduling Algorithm 2.8 Priority-based Scheduling Algorithm 2.9 Multiple-Processor, Real-Time 2.10 Multilevel Queue and Multilevel Feedback Queue Scheduling 2.11 Introduction of Deadlock, Deadlock Characterization, Necessary and Sufficient Conditions for Deadlock. 2.12 Deadlock Handling Approaches: Prevention, Avoidance. 2.13 Deadlock Handling Approaches: Detection and recovery.	1. Practice various scheduling algorithm numerical.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Draw and describe the Process Control Block
2. What is a deadlock? Elaborate the techniques to prevent and avoid a deadlock.

b. Mini Project:

NA

c. Other Activities (Specify):

02CA221.3: Understand the concepts of memory management techniques and file management.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Introduction to Memory Management. **SO3.2** Address Binding, Logical versus Physical Addressspace. **SO3.3** Swapping, Contiguous & Non-ContiguousAllocation. **SO3.4** Fragmentation (Internal & External), Compaction. **SO3.5** Paging, Segmentation, Virtual Memory. **SO3.6** Demand Paging, Performance of DemandPaging. **SO3.7** Page Replacement Algorithms. **SO3.8** File Management: Concept of File System (File Attributes, Operations, Types). **SO3.9** Functions of File System, Types of File System. **SO3.10** Access Methods (Sequential, Direct &other methods).	1. Linux Filter Commands:grep, cat, 2. Linux Filter Commands cut, grep 3. Linux Filter Commands:comm, sed, 4. Linux Filter Commands tee, tr, uniq, wc,od, sort, diff. 5. Linux Utility Commands:find, bc, locate, 6. Linux Utility Commands date, cal,	**Unit-3.0 Memory Management** 3.1 Memory Management: Introduction 3.2 Address Binding, Logical versus Physical Address space 3.3 Swapping, Contiguous & Non-Contiguous Allocation 3.4 Fragmentation (Internal & External), Compaction 3.5 Paging, Segmentation, Virtual Memory 3.6 Demand Paging, Performance of Demand Paging 3.7 Page Replacement Algorithms 3.8 File Management: Concept of File System (File Attributes, Operations, Types) 3.9 Functions of File System, Types of File System 3.10 Access Methods (Sequential, Direct & other methods) 3.11 Directory Structure (Single-Level, Two-Level, Tree-Structured, Acyclic-Graph, General Graph) 3.12 Allocation Methods (Contiguous, Linked, Indexed)	1. Study various memory allocation techniques.

SO3.11 Directory Structure (Single-Level, Two-Level, Tree-Structured, Acyclic-Graph, General Graph). **SO3.12** Allocation Methods (Contiguous, Linked, Indexed).			

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Write short notes on Page replacement algorithms.
2. Differentiate between fragmentation and segmentation.

b. Mini Project:

NA

c. Other Activities (Specify):

NA

02CA221.4: Understand the concepts of disk management. Understand and identify potential threats to Operating systems andthe security features to guard against them.

Approximate Hours

Item	Appx. Hrs.
CI	11
LI	12
SW	1
SL	1
Total	25

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Introduction to Disk Management. **SO4.2** Disk Scheduling Algorithms - FCFS. **SO4.3** Disk Scheduling Algorithms - SSTF. **SO4.4** Disk Scheduling Algorithms – SCAN. **SO4.5** Disk Scheduling Algorithms – C-SCAN. **SO4.6** Disk Scheduling Algorithms - LOOK. **SO4.7** Understand Swap Space Management, Disk	1. Linux Utility Commands: sleep, time, 2. Linux Utility Commands df, mount, 3. Linux Utility Commands: exit, clear, 4. Linux Utility Commands gzip, gunzip. 5. Linux Networking Commands: ip, ssh, 6. Linux Networking mail,ping, host	**Unit-4.0 Disk Management** 4.1 Disk Management: Structure 4.2 Disk Scheduling Algorithms - FCFS 4.3 Disk Scheduling Algorithms - SSTF 4.4 Disk Scheduling Algorithms – SCAN 4.5 Disk Scheduling Algorithms – C-SCAN 4.6 Disk Scheduling Algorithms - LOOK 4.7 Swap Space Management, Disk Reliability, Recovery 4.8 Security Threats, Security	1. Go through various Disk scheduling algorithms.

Reliability, Recovery. **SO4.8** Learn Security Threats, Security policy mechanism. **SO4.9** Learn about Protection, Trusted System. **SO4.10** Learn about Authentication and Internal Access Authorization. **SO4.11** Learn about Windows Security.		policy mechanism 4.9 Protection, Trusted System 4.10 Authentication and Internal Access Authorization. 4.11 Windows Security	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Write short notes on various Disk scheduling algorithms
2. Differentiate between Authentication and Authorization. Also, describe security threats and what should be the Security Policy mechanism.

b. Mini Project:
NA

c. Other Activities (Specify):
NA.

02CA221.5: Understand and operate the Linux system as well as the contribution of Indians in the field.

Approximate Hour

Item	Appx. Hrs.
CI	11
LI	12
SW	1
SL	1
Total	25

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

O5.1 Introduction to LINUX. **SO5.2** It's features and advantages. **SO5.3** Linux architecture. **SO5.4** Learn about Linux file system. **SO5.5** Learn about Linux directories and kernel. **SO5.6** Learn partitioning, installation and basic Linux commands. **SO5.7** Learn about Linux processes and disk management. **SO5.8** Comparison between Linux and various other operating systems available in the market. **SO5.9** Understand the importance of Linux Kernel, Files and Directories. **SO5.10** Understand the concept of Opensource Software. **SO5.11** Learn about the contributions of Indians.	1. Edit Crontab file: to wall message on system on particular time automatically. 2. Use of Vi editor: Createfile, edit, save and quit. 3. Vi editor: 4. Highligting the searched term within a file. cut, 5. yank,undo. 6. Compare windows and linux	**Unit-5.0 Linux** 5.1 LINUX: Introduction, History. 5.2 Features of Linux, advantages 5.3 Hardware requirements for installation, Linux architecture 5.4 File system of Linux - boot block, super block, inode table, data blocks 5.5 Linux standard directories, Linux kernel 5.6 Partitioning the hard drive for Linux, installing the Linux system, system - startup and shut-down process, init and run levels 5.7 Process, Swap, Partition, fdisk, Checking disk free spaces. 5.8 Difference between CLI OS & GUI OS, Windows v/s Linux. 5.9 Importance of Linux Kernel, Files and Directories. 5.10 Concept of Open-Source Software 5.11 Indian contribution to the field — the BOSS operating system, opensource software's, growth of LINUX, Arya Bhatt Linux, contributions of innovators — Rajen Sheth, Sunder Pichai etc.	1. Learn Linux commands.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Write the difference between CLI OS and GUI OS.
2. Describe LINUX Architecture.

b. Mini Project:

NA

c. Other Activities (Specify):

NA.

A K S University

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Curriculum of BCA

(Revised as on 01 August 2023)

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
02CA2211: Specify objectives of modernoperating systems and describe how operating systems have evolved over time.	13	12	1	1	27
02CA2212: understand various process management concepts and can compare various scheduling techniques, synchronization, and deadlocks. Also identify the best suited process management technique for any process.	13	12	1	1	27
02CA2213 Understand the concepts of memory management techniques and file management.	12	12	1	1	26
02CA2214: At the end of this chapter the student will understand the concepts ofdisk management. Understand and identify potential threats to Operating systems and the security features to guard against them.	11	12	1	1	25
02CA2215: At the end of this chapter the student will understand and operate the Linux system as well as the contribution of Indians in the field.	11	12	1	1	25
Total Hours	60	60	5	5	130

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction	02	05	01	08
CO2	Process Management	02	03	05	10
CO3	Memory Management	02	03	07	12
CO4	Disk Management	1	3	7	10
CO5	LINUX	1	05	05	10
Total		13	26	13	50

The end of semester assessment for Operating System will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Operating Systems: A Modern Perspective	G. Nutt	2nd Edition Pearson Education	
2	Operating Systems, Internals & Design Principles	W. Stallings	8th Edition, Pearson Education	
3	Operating Systems- Concepts and design	M. Milenkovic	Tata McGraw Hill	
4	Operating Systems Concepts	A Silberscliatz, P.B. Galvin, G. Gagne	8th Edition, John Wiley Publications	
5	Modem Operating Systems, 3rd Edition	A.S. Tanenbaum	Pearson Education.	

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COs, POs and PSOs Mapping

Program: BCA
Course Code: 02CA221
Course Title: Operating System

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO	PO	PO	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytic s, machine learning, artificial intelligence, and networking for the effective design of computer- based systems ofvarious complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidiscipline nary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies s.
CO 1: Specify objectives of modern operating systems and describe how operating systems have evolved over time.	2	2	3	3	3	1	1	3	1	1	1	3	2	3	3	1	2
CO 2: Understand various process management concepts and can compare various scheduling techniques, synchronization, and deadlocks. Also identify the best suited process management technique for any process.	1	3	2	3	2	2	2	2	1	1	1	3	2	2	2	1	3
CO3: Understand the concepts of memory management techniques and file management.	2	2	2	3	3	2	1	2	1	1	1	3	1	1	2	2	2
CO 4: Understand the concepts of disk management. Understand and identify potential threats to Operating systems and the security features to guard against them.	1	2	3	2	3	2	1	3	1	2	1	3	3	3	3	2	2
CO 5: Understand and operate the Linux system as well as the contribution of Indians in the field.	1	2	2	2	3	2	1	3	1	1	1	3	3	3	1	3	3

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Specify objectives of modern operating systems and describe how operating systemshave evolved over time.	SO1.1, SO1.2, SO1.3, SO1.4, SO1.5, SO1.6, SO1.7, SO1.8, SO1.9, SO1.10, SO1.11, SO1.12, SO1.13		Unit-1 Introduction 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10, 1.11,1.12,1.13	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Understand various process management conceptsand can compare various scheduling techniques, synchronization, and deadlocks.Also identify the best suited process management technique for any process.	SO2.1, SO2.2, SO2.3, SO2.4, SO2.5, SO2.6, SO2.7, SO2.8, SO2.9, SO2.10, SO2.11, SO2.12, SO2.13		Unit-2 Process Management 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Understand the conceptsof memory management techniques and file management.	SO3.1, SO3.2, SO3.3, SO3.4, SO3.5, SO3.6, SO3.7, SO3.8, SO3.9, SO3.10, SO3.11, SO3.12		Unit-3 Memory Management 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10, 3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Understand the concepts of disk management. Understandand identify potential threats to Operating systems and the security features to guard against them.	SO4.1, SO4.2, SO4.3, SO4.4, SO4.5, SO4.6, SO4.7, SO4.8, SO4.9, SO4.10, SO4.11		Unit-4 Disk Management 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Understand and operate the Linux system as well as the contribution of Indians in the field.	SO5.1, SO5.2, SO5.3, SO5.4, SO5.5, SO5.6, SO5.7, SO5.8, SO5.9, SO5.10, SO5.11		Unit-5 LINUX 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10, 5.11	

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-III

Course Code: **0CA301**

Course Title: Data Analytics & Visualization through Spread Sheet

Pre-requisite: Student should have basic knowledge of MS-Excel

Rationale: Data analytics and visualization is important because it helps to process data sets and creating visual instances.

Course Outcomes:

0CA3011: Students should be familiar with various characteristics of the spreadsheet.
0CA301: Learn how to format spreadsheet, and viewing its appearance before printing.
0CA3013: Importing/Exporting Access Data and Text Files. Securing worksheet and workbook.
0CA3014: Calculate values and process data through various formula, and using data validation formula.
0CA3015: Visualize data values through various types of charts.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Skill Enhancement	0CA301	Data Analytics & Visualization through Spread Sheet	2	0	2	1	5	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecture(L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Skill Enhancement	0CA301	Data Analytics & Visualization through Spread Sheet	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

0CA301.1: Students should be familiar with various characteristics of the spreadsheet.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO1.1 Understanding various brands of spreadsheets. **SO1.2** Understanding basic components of spreadsheet. **SO1.3** Understanding cell modes. **SO1.4** Understanding various data types used in spreadsheet.		**Unit-1.0 Introduction to Spreadsheet** 1.1 Brands and Platforms, Excel, Calc, and Google Sheets, 1.2 User Interface, Ribbon, Quick Access toolbar. 1.3 Workbooks and Worksheets. Opening new file and saving Spreadsheet, Rows, Columns, Cells, 1.4 Fundamentals of rows, Columns and cell and navigation; 1.5 Various modes of selecting cells (shift arrow, ctrl shift arrow, mouse click and drag, mouse click and shift click); 1.6 Merging cells; Selecting rows and columns, Non-contiguous cells; How to enter data (numeric, text, date),	Learning basic features and components of sheets.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Create MS-Excel Sheet and Save it.
2. Show cells merging in sheet.

b. Mini Project:

Creating a sheet having 100 student's data.

c. Other Activities (Specify):

NA

0CA301.2: Learn how to format spreadsheet, and viewing its appearance before printing.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Understand printing area and preview of worksheet. **SO2.2** Understand page layout and orientation. **SO2.3** Understand page color and border. **SO2.3** Understand header and footer.		**Unit-2.0 Printing Worksheet** 2.1 Select print area, See print preview, Adjusting margin during print preview. 2.2 Page Formatting: Page layout - Orientation, Size, margins; Watermark, 2.3 Page color, Page borders; 2.4 Inserting headers and footer, Inserting page numbers, 2.5 Date, Path and filename. Viewing: Easy view using freeze panes, Split windows, Layout view 2.6 Saving and Sharing File.	Learning sheet formatting and its preview.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Insert header and footer in sheet
2. Split window into sheet

b. Mini Project:

Create a sheet format it using various possible tools.

c. Other Activities (Specify):

NA

0CA301.3: Importing/Exporting Access Data and Text Files. Securing worksheet and workbook.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding importing Access Data. **SO3.2** Understanding XML data format. **SO3.3** Understanding protection and security properties. **SO3.4** Understanding Microsoft queries.		**Unit-3.0 Import and Export Data** 3.1 Import Access Data, 3.2 Microsoft Query, XML. 3.3 Import/Export Text Files, 3.4 Protecting/Securing using file properties: 3.5 Protect Workbook, Read-only Workbook. 3.6 Protect Sheet, Lock Cells,	Exporting and Importing data and protecting sheets.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Prepare XML file.
2. Protect workbook.

b. Mini Project:

Create Access Database and Import into MS-Excell Sheet.

c. Other Activities (Specify):

NA

0CA301.4: Calculate values and process data through various formula, and using data validation formula.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Understanding editing and copying formula. **SO4.2** Understanding cell referencing. **SO4.3** Understanding date rejection and validation. **SO4.4** Understanding measurement standards.		**Unit-4.0 Calculations** 4.1 Entering formula, Editing formula, Copying formula 4.2 Cell references, Paste formula 4.3 Data Validation, Reject Invalid Dates, Prevent Duplicate Entries 4.4 Budget Limit, Product Codes, 4.5 Drop-down List, Dependent Drop-down Lists, 4.6 CM to Inches, KG to GM.	Learning different types of formula and data validation methods.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Write down various steps for copying and pasting formula.
2. Write down various steps for entering and editing formula.

b. Mini Project:

Create a summary on Budget Limit features.

c. Other Activities (Specify):

NA.

0CA301.5: Visualize data values through various types of charts.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understanding basics of chart. **SO5.2** Understanding various types of charts. **SO5.3** Understanding chart components. **SO5.4** Understanding format and design of chart.		**Unit-5.0 Data Visualization** 5.1 Introduction to charts, Various type of charts (Column, Bar, Pie, Area, XY Scatter, Bubble, Net, Stock, Column & Line) 5.2 3-D Shape (Bar, Cylinder, Cone, Pyramid); 5.3 Chart elements (Title, Subtitle, X-axis, Y- axis, Z-axis, Display grids, Legends, Display data series); 5.4 Creating a Chart, Selecting data series, 5.5 Select chart type, Select chart components 5.6 Labels, background, axes, Format and design.	Creating different types of charts.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Crete a simple pie chart.
2. Create 3-D shape chart.

b. Mini Project:

Apply various 3-D features into chart.

c. Other Activities (Specify):

NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
0CA301.1: familiar with various characteristics of the machine learning.	6	0	2	1	9

0CA301.2: learn how algorithm works for data processing and instance generation.	6	0	2	1	9
CO3: create genome sequence by using machine learning algorithm.	6	0	2	1	9
CO4: implement classification and regression process techniques for data processing.	6	0	2	1	9
CO5: Apply statistics in machine learning for probabilistic analysis.	6	0	2	1	9
Total Hours	30	0	10	5	45

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
0CA301.1	Students should be familiar with various characteristics of the spreadsheet.	02	05	01	08
0CA301.2	Learn how to format spreadsheet, and viewing its appearance before printing.	02	03	05	10
0CA301.3	Importing/Exporting Access Data and Text Files. Securing worksheet and workbook.	02	03	07	12
0CA301.4	Calculate values and process data through various formula, and using data validation formula.	1	3	7	10
0CA301.5	Visualize data values through various types of charts.	1	05	05	10
Total		13	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Data Analytics & Visualization through Spread Sheet will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Beginning OpenOffice Calc: From Setting Up Simple Spreadsheets to Business Forecasting	Jacek Artymiak	Apress	2011, 1st Edition
2	Microsoft Excel 2019 Bible: The Comprehensive Tutorial Resource	Michael Alexander Richard Kusleika John Walkenbach	Wiley Publication	2018, 1st Edition
3	Excel: Quick Start Guide from Beginner to Expert (Excel, Microsoft Office)	William Fischer	CRC Press	2016, 1st Edition

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COs, POs and PSOs Mapping

Program: B.C.A
Course Code: 0CA301
Course Title: Data Analytics & Visualization through Spread Sheet

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Computer knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: familiar with various characteristics of the machine learning.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: learn how algorithm works for data processing and instance generation.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3: create genome sequence by using machine learning algorithm.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4: implement classification and regression process techniques for data	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2

processing.																	
CO5: Apply statistics in machine learning for probabilistic analysis.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1: familiar with various characteristics of the machine learning.**	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 Introduction to Spreadsheet 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2: learn how algorithm works for data processing and instance generation.**	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Printing Worksheet 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3: create genome sequence by using machine learning algorithm.**	SO3. 1 SO3. 2 SO3.3 SO3.4		Unit-3 Import and Export Data 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4: implement classification and regression process techniques for data processing.**	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Calculations 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5: Apply statistics in machine learning for probabilistic analysis.**	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 Data Visualization 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of BCA Program

Semester-III

Course Code: 0CA302

Course Title : DTP [Desktop Publishing]

Pre-requisite: MS word, Excel, MS Paint

Rationale: This course introduces students to the principles of design applicable to publications created using desktop publishing software and computer technology. Special attention is given to design principles, typography, and layout and production techniques. This class focuses on gaining professional-level skills and knowledge. In this course, the students will discover how to use the essential building blocks of design type, art and line in new and creative ways, learn clever ways to locate and use resources such as graphics and scanned art, learn to think about audience and medium and how those affect the way you craft your message and also be learning to use new technical tools to create those effective messages.

Course Outcomes:

0CA302.1: Understand basics of computer and its related terminology.
0CA302.2: Write, Edit & Print documents using PageMaker.
0CA302.3: Understand various Photoshop tools used for Desktop Publishing and would be able to edit an image.
0CA302.4: Apply different CorelDraw tools and options to create a poster, Monogram, Visiting card etc.
0CA302.5: Understand Color concept in Printing.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credit (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Skill Enhancement	0CA302	**DTP**	2	0	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
SE	0CA302	DTP	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

0CA302.1: **Understand basics of computer and its related terminology.**

Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	2
SL	1
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the concept of Computer fundamentals. **SO1.2 Compare** types of Software. **SO1.4 Use** MS Word & Excel for documentation. .		**Unit-1. COMPUTER FUNDAMENTALS: (09Lectures)** 1.1.1 Computer and Its Advantages & Disadvantages, 1.1.2 Generations of computer. 1.1.3 Block Diagram of a Computer, 1.1.4 Description of Different parts of a computer, System Software and Application Software, 1.1.5 Introduction to MS Office, Word Processing Software. 1.1.6 Electronic Spreadsheet, MS Paint	1. Search devices use in computer 2. Excel formulas

SW-1 Suggested Sessional Work (SW):

a. Assignments:

(i) Explain Software and its type.

b. Presentation

c. Pictorial representation of Block Diagram of Computer.

0CA302.2: **Write, Edit & Print documents using PageMaker.**

Approximate Hours

Item	Appx. Hrs.
Cl	05
LI	0
SW	2
SL	1
Total	08

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand the concept of PageMaker. **SO2.2 Use** the various tools of PageMaker.	.	Unit-2 **PageMaker** **(05 Lectures)** 2.1 PageMaker Introduction & its various versions. 2.2 Concepts and applications of PageMaker. 2.3 Guides & rulers. 2.4 Drawing tools 2.5 Fills & outlines.	1. Learn all menu of PageMaker.

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain fill and outlines

b. Presentation

c. Pictorial representation of PageMaker Drawing tools:

CO101.3: Understand various Photoshop tools used for Desktop Publishing andwould be able to edit an image.

Approximate Hours

Item	Appx. Hrs.
Cl	07
LI	0
SW	2
SL	1
Total	10

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand the concept of Photoshop and its tools **SO3.2 Use** various tools of Photoshop to edit an image.	.	**Unit-3: Photoshop:** **(07 Lectures)** 3.1 History & introduction of Photoshop, 3.2 The File Menu, 3.3 The tools, 3.4 Drawing lines & Shapes. 3.5 Photo editing/inserting starting with setting up, 3.6 Introduction of layers, 3.7 Understanding Design principles and color theory,	i. Edit an image using various tools and options.

SW-3 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain submenus of File menu.

b. Presentation

c. Pictorial representation of Photoshop Toolbox:

0CA3021.4: Apply different CorelDraw tools and options to create a poster, Monogram, Visiting card etc.

Approximate Hours

Item	Appx. Hrs.
Cl	06
LI	0
SW	2
SL	1
Total	09

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand the concept of Corel Draw **SO4.2 Use** of various tools in CorelDraw **SO4.3 Utilizes** CorelDraw tools and options to create a logo/visiting cards/poster etc.	.	**Unit-4 : Corel Draw:** **(06 Lectures)** 4.1. Corel Draw introduction 4.2. Drawing lines shapes. 4.3. Inserting-pictures, objects, tables, templates 4.4. Use of various tools such as Pick tools, Zoom tools, Free hand tool, square tool 4.5. Use of various tools such as rectangle tool, text tool, fill tool etc. 4.6. all fonts used in designing of monograms, logos, posters, stickers, greeting cards, wedding cards, visiting cards, etc.	i. Create a logo/visiting card/poster

SW-4 Suggested Sessional Work (SW):

Assignments: a.

(i) How can we insert image, table and templates?

b. Presentation

c. Pictorial representation of CorelDraw Tools

0CA302.5: Understand Color concept in Printing.

Item	Appx. Hrs
Cl	03
LI	0
SW	2
SL	1
Total	06

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 **Understand** the concept of Color Harmony SO5.2 **Demonstrate** the use of Color		**Unit5: Introduction to colors: (03 Lecture)** 5.1. Design Principles & Color Harmony 5.2. Introduction to Colors- Primary and 5.3 Secondary in RGB schemes/modes. 5.4. Introduction to Colors- Primary and 5.5Secondary in CMYK 5.6 schemes/modes.	1.Learn color wheel

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Explain Design Principles

b. Presentation:

c. Other Activities (Specify): Group discussion on important topics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Understand basics of computer & its related terminology.	06	02	01	9
CO2: Write, Edit & Print documents using PageMaker.	05	02	01	08
CO3: Use various Photoshop tools and Edit an image.	07	02	01	10
CO4: Create a Poster, Monogram, Visiting card etc.	06	02	01	09
CO5: Understand Color concept in Printing.	06	02	01	06
Total Hours	30	10	05	45

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Unit-1	03	02	03	08
CO-2	Unit-2	03	01	05	09
CO-3	Unit-3	03	07	02	12
CO-4	Unit-4	03	05	05	13
CO-5	Unit-5	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for autonomous system for AI and DS will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Desk Top Publishing from A to Z	Bill Grout and Osborne	McGraw Hill	
2	DTP (Desk Top Publishing) for PC user	Houghton	Galgotia Publishing House Pvt. Ltd., Daryaganj, New Delhi.	
3	Corel draw the Official Guide	Gray David Bouton	Corel Press	

A. Alternative NPTEL/SWAYAM/MOOC Course (if any): NA

Curriculum Development Team

1. Dr. Akhilesh A. Waoo, HOD, Department of Computer Science and Engineering.
2. Dr. Pramod Singh, Associate Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science and Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
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COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 0CA302
Course Title: DTP

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1 The student will Understand basics of computer and its related terminology.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

CO2 The student will Write, Edit & Print documents using PageMaker.	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**	**2**
CO3 The student will Understand various Photoshop tools used for Desktop Publishing and would be able to edit an image.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO4: The student will Apply different CorelDraw tools and options to create a poster, Monogram, Visiting card etc.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO.5: The student will Understand Color concept in Printing.	-	-	-	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4,5	CO1 The student will Understand basics of computer and its related terminology.	SO1.1 SO1.2 SO1.3		UNIT – I: Computer Fundamentals 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2 The student will Write, Edit & Print documents using PageMaker.	SO2.1 SO2.2		UNIT – II: PageMaker 2.1, 2.2, 2.3, 2.4, 2.5	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3 The student will Understand various Photoshop tools used for Desktop Publishing and would be able to edit an image.	SO3.1 SO3.2		UNIT – III: Photoshop 3.1,3.2,3.3,3.4,3.5,3.6,3.7	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: The student will Apply different CorelDraw tools and options to create a poster, Monogram, Visiting card etc.	SO4.1 SO4.2 SO4.3		Unit-4: CorelDraw 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO.5: The student will Understand Color concept in Printing.	SO5.1 SO5.2		Unit-5: Introduction to colors 5.1,5.2,5.3	

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-III

Course Code: **01CA311**

Course Title: Programing in C#

Pre-requisite: Fundamentals of Computer.

Rationale: C# Programing language is one of the widely used programing language amount game developer and application for creating application based on dot net framework.

Course Outcomes:

On successful completion of this course, the students will be able to:

01CA311.1. Knowledge of the structure and model of the programming language C #.

01CA311.2. Determine logical alternatives with C# decision structures utilizing iteration, class methods, fields, and properties.

01CA311.3. Using the programming language C # for various programming technologies (understanding) 4. Develop software in C#.

01CA311.4. Evaluate user requirements for software functionality required to decide whether the programming language C # canmeet user requirements.

01CA311.5. Use of certain technologies by implementing them in the C # programming language to solve the given problem.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Major	01CA311	Programing in C#	4	4	1	1	10	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)		
			Progressive Assessment (PRA)	End Semester Assessment	Total Marks

			Class/Home Assignment 5 number	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+ AT)	**(ESA)**	(PRA + ESA)
Major	01CA311	**Programming in C#**	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	**Couse Code**	**Course Title**	**Scheme of Assessment (Marks)**						
			Progressive Assessment (PRA)					**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	**Viva1 (5)**	**Viva2 (5) (SA)**	**Class Attendance (AT)**	**Total Marks (CA+CT+SA+ CAT+AT)**		
Major	01CA311	**Programming in C#-Lab**	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

01CA311.1: Knowledge of the structure and model of the programming language C#.

Approximate Hours

Item	**Appx. Hrs.**
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Master C# syntax, variables, data types, operators, and keywords. SO1.2 Understand functions (call by value, reference, out parameters). SO1.3 Utilize constructors, destructors, static members, and Enums. SO1.4 Explore inheritance, aggregation, and polymorphism. SO1.5 Manage strings, exceptions, and file I/O. .	1. Demonstrate the declaration and usage of different variable types in C#. Provide examples showcasing their initialization, modification, and usage in operations. 3 Explore various data types in C# including primitive and reference types. 4. Illustrate their usage with suitable examples. 5.Discuss different operators and their precedence in C#. 6. Provide examples demonstrating their usage in arithmetic, logical, and relational operations.	Unit-1 Introduction to Programing in C# Syntax and Control Flow Introduce and discuss key syntax elements. Engage in hands-on coding exercises for control flow statements Functions and Arrays: Explore functions, emphasizing call by value, Reference, and out parameters. Practice array manipulation through coding exercises. 1.6 Objects and Classes: Understand the core principles of object-oriented programming. Dive into practical coding with constructors, destructors, static members, and Enums. Inheritance, Polymorphism, Abstraction: Learn about inheritance, aggregation, and polymorphism. Engage in coding activities focusing on abstraction using abstract classes and interfaces. Inheritance, Polymorphism, Abstraction: Learn about inheritance, aggregation, and polymorphism. Engage in coding activities focusing on abstraction using abstract classes and interfaces.	Basic Feature of C# Programing, Syntax Based Code.

SW-1 Suggested Sessional Work (SW):

Assignments:

I. Write a program to create a simple calculator using variable and operators.

II. Write a C# program to determine if a user-input integer is prime, using if-else statements and a custom primality-checking function.

Mini Project:

I. Write a C# program to determine if a user-input integer is prime, using if-else statements and a custom primality-checking function.

01CA311.2: Determine logical alternatives with C# decision structures utilizing iteration, class methods, fields, and properties.

Approximate Hours

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Demonstrate a deep understanding of C# decision structures, including if-else statements and switch-case, in solving logical problems. **SO2.2** Master iteration using for loops, while loops, and do-while loops in C#. **SO2.3** Understand the concept of methods within classes in C#. **SO2.4** Utilize properties to enforce validation rules and provide a clean interface for class consumers. **SO2.5** Implement class methods and fields to encapsulate functionality and data within a class.	1. Define functions in C# and differentiate between call by value and call by reference mechanisms. Provide examples to demonstrate their implementation. 2. Create a program that utilises arrays in C#. Implement functions to perform operations like sum, average, and searching within arrays. 3. Design a class in C# representing a student. Include appropriate constructors, member variables, and methods for setting and retrieving student information. and. 4. Utilise enums and structs in C# to define custom data types. 5. Provide examples demonstrating their usage and advantages over primitive data types. 6. Example of data validation	**Unit-2.0 C# Functions:** 2.1. Decision Structures Exploration: 2.2. Begin with a review of if-else statements and 2.3. introduce switch-case structures. • Discuss scenarios where each decision structure is most effective. 2.4. Iteration Techniques: • Cover for loops, while loops, and do-while loops. 2.5. Discuss when to choose one iteration technique over another based on the problem at hand. 2.6. Class Methods and Fields: 2.7. Understand the role of methods within classes. 2.8. Explore the implementation of class methods and fields for encapsulation. 2.9. 1.4 Properties in C#: 2.10. Introduce the concept of properties for controlled access to class fields. 2.11. Discuss the significance of using properties for data validation 2.12. and encapsulation.	Program of Functions & Basic Understanding

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Develop a C# program to convert numerical grades to letter grades using if-else. Add a loop for continuous user input, allowing grades to be processed until the user decides to exit.

ii. Create a C# banking account class with methods for deposit, withdrawal, and balance inquiry. Implement properties to ensure secure access to the account balance.

Mini Project:

Build a C# mini project for real-time IoT data processing. Use decision structures for anomaly detection, employ iteration for continuous processing, and design a class with methods and properties for efficient data management. Prioritize error handling and optimal data processing techniques.

01CA311.3: Using the programming language C # for various programming technologies (understanding). Develop software in C #.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understanding C# in Diverse Technologies: **SO3.2** Developing Software in C#: **SO3.3** Web Development with C# (ASP.NET): **SO3.4** Multiplatform Application Development Windows & Linux **SO3.5** Concept of Multidimensional Arrays.	1. Implement properties in C# to encapsulate data within a class. 2.Explain the advantages of using properties over public variables. 3.Implement polymorphism in C# by overloading methods and overriding base class methods. 4. Provide examples demonstrating method overloading and method overriding. 5. Create an abstract class representing a shape in C#. Derive concrete shapes like rectangle, circle, and triangle from the abstract class. Implement	**Unit-3.0 Programing Platform & Technologies.** **3.1.** Introduction to C# in Different Technologies: **3.2.** Discuss the diverse applications of C# in web development, mobile app creation, and cloud services. **3.3.** 3.2 Hands-on Development with C#: **3.4.** Engage in practical coding sessions to **3.5.** develop software solutions using C#. **3.6.** 3.3 Web Development with C# (ASP.NET): **3.7.** Conduct a web development workshop, **3.8.** creating a basic web application using C# and ASP.NET. **3.9.** 3.4 Cross-Platform **3.10.** Mobile App Development **3.11.** Develop a basic mobile application that **3.12.** runs seamlessly on both	Full Fledge Application using C# interdependent platform interface.

	methods for calculating area and perimeter for each shape. And Define an interface in C# representing a printable object. 6. Implement the interface in classes representing documents, images, and text files. Demonstrate the usage of interfaces.	Android and iOS platforms.	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Create a C# program that uses ASP.NET to build a simple web application for a bookstore. Implement features for adding, editing, and deleting books from an online catalogue.

ii. Develop a cross-platform mobile app using Xamarin and C#. The app should have a user authentication system and a feature that allows users to share images with captions.

b. Mini Project:

iii. Design a cloud-based task manager using C# and Microsoft Azure. Implement features for task creation, assignment, and completion tracking.

01CA311.4: Evaluate user requirements for software functionality required to decide whether the programminglanguage C # can meet user requirements.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

SO4.1 String Manipulation: **SO4.2** Exception Handling: **SO4.3** File Input/Output Operations: **SO4.4** Serialization and Deserialization: **SO4.5** System.IO Namespace. **SO4.6** Practical Application.	a file, manipulates it, and writes the modified data back to another file. 4. Explore advanced file I/O operations in C# using FileStream, BinaryReader, and BinaryWriter classes. Implement a program that reads binary data from a file, performs operations, and writes back the modified binary data. 5. Implement custom exceptions in C# to handle specific error scenarios in a program. Provide examples demonstrating the creation and usage of custom exceptions. 6. Utilize serialization and deserialization techniques in C# to persist and retrieve object data. Implement a program that serializes objects to a file and deserializes them back.	**Unit-4.0 C# Strings, Exceptions, File I/O** 4.1 String Manipulation in C#: 4.2 Explore the various methods and operations available for string manipulation 4.3 Editingformula 4.4 Exception Handling Techniques: 4.5 Understand the importance of exception handling in writing robust C# programs. 4.6 File Input/Output Operations: 4.7 Dive into the world of file input/output using C#. 4.8 Serialization and Deserialization: Grasp the concepts of serialization and deserializationin C#. 4.9 System.IO Namespace and Advanced 4.10 File Operations: 4.11 Explore the classes within the System.IO namespace for 4.12 advanced file manipulations	Exception Handling & String.

SW-4 **Suggested Sessional Work (SW):**

a. Assignments:

i. Write a C# program that takes a user-input sentence and performs the following string manipulations:Convert the sentence to uppercase.Reverse the sentence.Count the occurrences of a specific character (user-defined) in the sentence.

ii. Develop a C# program that involves file I/O operations. Implement exception handling to address scenarios like file not found, unauthorized access, and invalid file format. Provide meaningful error messages for each exception.

b. Mini Project:

i. Task: Design a C# mini project for a file explorer utility application. Include features such as file listing, copying, moving, and deleting. Implement robust exception handling for potential file-related errors. Utilize C# strings for efficient file path manipulation.

01CA311.5: Use of certain technologies by implementing them in the C # programming language to solve the givenproblem.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Generics in C#: **SO5.2** Delegates and Events: **SO5.3** Reflection in C#: **SO5.4** Multithreading and Thread Safety: **SO5.**5 Synchronization in C#:	1. Implement generics in C# to create a generic collection. Demonstrate the advantages of using generics over non-generic collections. 2. Explore delegates in C# and demonstrate their usage in implementing callback mechanisms. Provide examples illustrating the concept of delegates. 3. Utilize reflection in C# to obtain metadata about types and	**Unit-5.0 Generics, Delegates, Reflection, Multithreading, Synchronization, Web Service** **5.1.** Generics Coding Exercise: Engage in hands-on coding exercises to implement generic types and methods. **5.2.** Delegate-Based Event Handling: **5.3.** Practice implementing delegates and **5.4.** events in C# to handle various scenarios. **5.5.** eflection Workshop: Explore reflection through **5.6.** practical examples, dynamically examining and manipulating types. **5.7.** Multithreading Lab: Implement multithreading in C# and **5.8.** address challenges related to thread safety. **5.9.** Synchronization Exercise: Apply synchronization techniques to ensure thread safety in shared resources.	

	members at runtime.	**5.10.** Web Service Integration Project: **5.11.** Develop a C# project that integrates with a web **5.12.** service, showcasing real-world application	
	Implement a program that dynamically loads and invokes methods using reflection. 4. Implement multithreading in C# to perform concurrent tasks. Create a program that utilizes multiple threads to perform CPU-intensive and I/O-bound operations concurrently. 5. Ensure thread safety in C# programs using synchronization techniques like locks and mutexes. Implement a program that demonstrates the usage of synchronization to avoid race conditions. 6. Create a simple web service in C# using ASP.NET Web API. Implement endpoints for CRUD operations on a resource and demonstrate their functionality using a client application.	.	

SW-5 Suggested Sessional Work (SW):

a. Assignments

i. Develop a C# program that utilizes generics to create a flexible data structure (e.g., a generic list, stack, or queue). Demonstrate the application of generic types and methods for various data types.

ii. Write a C# program that simulates a shared resource accessed by multiple threads. Implement multithreading to enhance performance and synchronization mechanisms to ensure thread safety.

b. Mini Project:

i. Design a C# mini project for an interactive web quiz application. Implement features such as user registration, quiz creation, and scoring. Utilize web services for real-time updates and leverage multithreading for improved responsiveness.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total Hour (Cl+SW+Sl)
CO1: Knowledge of the structure and model of the programming language C #.	12	12	1	1	26
CO2: Determine logical alternatives with C# decision structures utilizing iteration, class methods, fields, and properties.	12	12	1	1	26
CO3: Using the programming language C # for various programming technologies (understanding) Develop software in C #.	12	12	1	1	26
CO4: Evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements.	12	12	1	1	26
CO5: Use of certain technologies by implementing them in the C #programming language to solve the given problem.	12	12	1	1	26
Total Hours	60	60	5	5	130

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

COs	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Unit-1 Introduction to Programing in C#	02	01	01	04
CO2	Unit-2.0 C# Functions:	02	04	02	08
CO3	Unit-3.0 Programing Platform & Technologies.	03	05	04	12
CO4	Unit-4.0 C# Strings, Exceptions, File I/O	02	08	05	15
CO5	Unit-5.0 Generics, Delegates, Reflection, Multithreading, Synchronization, Web Service	03	05	03	11
Total		12	23	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Data Analytics & Visualization will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture

2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit any software development company
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

Textbooks:

l. E Balagurusamy: Programming in C#, McGraw Hill Education, 4th edition, 2017.
2. JoydipKanjilal: Mastering C# 8.0, BPB Publication, 2019.
3. J.G.R. Sathiaseelan: Programming With C Sharp .Net, PHI Learning, 2009.

Reference Book.

l. Bill Wagner: Effective C#, Pearson Education, Third edition, 2017.
2. Doyle B: C# Programming From Problem Analysis To Program Design, Cengage, 2014.
3. S. Thamarai Selvi, R. Mumgesan: A TextBook on C#, Pearson Education India, 2003.
4. MILES: Begin to Code with C#, PHI Learning.

Curriculum Development Team

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16. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

CO, PO and PSO Mapping

Course Title: B.C.A.
Course Code : 01CA311
Course Title: Programming in C#

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
	Computational information	Difficulty Analysis	Drawing / Improvement of Solutions	Accomplish Investigations of Compound Computing Troubles	: Current Implement Procedure	Proficient Principles	Ultimate Education	Mission Administration	Announcement Usefulness	Public & Ecological Alarm	Personality & Group Job	Modernization and Private Enterprise	An ability to enhance the application of knowledge of theory subjects in diverse fields	Develop language proficiency to handle corporate communication demands.	Preparing students in various disciplines of technologies such as computer applications, computer networking, software engineering, JAVA, database concepts and programming	In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced
CO1: Knowledge of the structure and model of the programming language C #.	3	2	3	3	2	1	1	1	1	2	1	3	2	2	3	3
CO2: Determine logical alternatives with C# decision structures utilizing iteration, class methods, fields, and properties.	2	3	3	3=2	2	2	1	2	1	2	1	3	2	3	2	3

CO3: Using the programming language C # for various programming technologies (understanding) Develop software in C #.	2	2	2	3	2	2	2	1	1-2	1	1	3	2	2	2	3
CO4: Evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements.	2	2	3	2	2	2	1	1	1	1	2	3	2	2	3	2
CO5: Use of certain technologies by implementing them in the C # programming language to solve the given problem.	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2

POs & PSOs /*-No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4	PC402.l Knowledge of the structure and model of the programming language C #.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	L1.1,1.2,1.3,1.4,1.5,1.6	**Unit-1 Introduction to Programing in C#** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As Mentioned in Page no._____to _____
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4	PC402. 2 Determine logical alternatives with C# decision structures utilizing iteration, class methods, fields, and properties.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	L2.1, 2.2, 2.3, 2.4, 2.5, 2.6,	**Unit-2.0 C# Functions:** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6,2.7,2.8,2.9	
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4	PC402. 3. Using the programming language C # for various programming technologies (understanding) 4. Develop software in C #.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	L3.1,3.2,3.3,3.4,3.5,3.6,	**Unit-3.0 Programing Platform & Technologies** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4	PC402. 4. Evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements.	SO4.1 SO4.2 SO4.3 SO4.4	L4.1,4.2,4.3,4.4,4.5,4.6	**Unit-4.0 C# Strings, Exceptions, File I/O** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO: 1,2,3,4,5,6,7,8,9,10,11,12 PSO:1,2,3,4	PC402. 5. Use of certain technologies by implementing them in the C # programming language to solve the given problem.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	L5.1,5.2,5.3,5.4,5.5,5.6	**Unit-5.0 Generics, Delegates, Reflection, Multithreading, Synchronization, Web Service** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-III

Course Code: **02CA321**

Course Title : Internet of Things

Pre-requisite: Student should know basic knowledge of computer & digital electronics.

Rationale: 'It's all about the role of Sensors log Data!'
IoT is the super set of information technology driven by the sensors and cloud to make the real things like smart things for your network.
To understand the concepts of web of Things, Cloud of Things and emphasis on Mobile cloud.

Course Outcomes:

02CA321.1: Learn the basics of IoT and IoT Architectural view.
02CA321.2: Understand various theoretical and practical principles involved in the design of Data Storage in IoTand use of Software defined networking.
02CA321.3: Learn the Web communication Protocols for connected devices and Message communication Protocolsfor connected devices.
02CA321.4: Design and implement Sensor Technology and Participatory Sensing.
02CA321.5: Design an IoT Privacy and security solutions.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours(CI+LI+SW+SL	
Minor	02CA321	IOT	4	4	1	1	10	6

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Minor	02CA 321	IoT	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA +CAT+AT)		
Minor	02CA 321	IoT	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, whichstudents are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement ofCourse Outcomes (COs) upon the course's conclusion.

02CA321.1: Learn the basics of IoT and IoT Architectural view.

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	(LI)	Classroom Instruction (CI)	(SL)
SO1.1 Understand the Definition and concept of Internet of Things. **SO1.2** Understand the concept of Characteristics of IoT **SO1.3** Understand the IoT Conceptual framework. **SO1.4** Preparation of Physical design, Logical design of IoT with Architectural view. **SO1.5** Preparation of Application of IoT.	1. Explore Arduino 2. Explore raspberry PI 3. Select any one development board (Eg., Arduino or Raspberry Pi) and control LED using the board. 4. Using the same board as in (1), read data from a sensor. 5. Experiment with bothanalog and digital sensors. 6. Control any two actuators connected to the development board using wireless network	**Unit-1.0 Theoretical Framework of IoT** 1.1. Introduction to IoT 1.2 Definition of IoT 1.3 Characteristics of IoT 1.4 IoT Conceptual framework 1.5 IoT Architectural 1.6 Physical design of IoT 1.7 Logical design of IoT 1.8 Application of IoT 1.9 learn by case study 1.10 learn by example 1.11 IoT view 1.12 Applications in education department	

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**

b. **Presentation**

02CA321.2: Understand various theoretical and practical principles involved in the design of Data Storage in IoT anduse of Software defined networking.

Approximate Hours

Item	Appx Hours
Cl	12
LI	12
SW	1
SL	1
Total	14

Session Out comes (SOs)	(LI)	Classroom Instruction (CI)	(SL)
SO2.1 Concept of Machine-to-Machine (M2M) **SO2.2** Understanding about the SDN (Software defined networking). **SO2.3** Concept of NFV (Network function virtualization) for IoT. **SO2.4** Understanding the Data Storage in IoT. **SO2.5** Preparation of IoT cloud Based Services.	1. Read data from sensor and send it to a requesting client. (using socket communication) Note: The client and server should be connected to same local area network. 2. Data transmission protocol using ESP8266 3. Push sensor data to cloud. 4. Use of moisture sensor 5. Use of motion sensor 6. Use of relay	**Unit 2.0** Machine-to-Machine (M2M) 1.1 SDN (Software defined networking) and 1.2 NFV (Network function virtualization) 1.3 Data Storage in IoT. 1.4 IoT cloud Based Services. 1.5 SDN architecture 1.6 NFV architecture 1.7 Data Storage Techniques 1.8 IoT cloud Based Services for agriculture 1.9 Applications 1.10 Learn by example 1.11 Machine types 1.12 Case study.	

02CA321.3: Learn the Web communication Protocols for connected devices and Message communicationProtocols for connected devices.

Approximate Hours

Item	Appx Hours
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	(LI)	Classroom Instruction (CI)	(SL)

SO3.1 concept of Design principles for web connectivity **SO3.2** Understanding Web communication Protocols for connected devices **SO3.3** Understanding the Message communication Protocols for connected devices. **SO3.4** Understanding about SOAP, REST, HTTP Restful and web Sockets. **SO3.5** Concept of Internet Connectivity, Internet based communication, IP addressing in IoT and Media Access Control.	1. Control an sensor through cloud. 2. Access the data pushed from sensor to cloud and apply any data analytics or visualization services. 3. Design a mobile app to control a sensor. 4. Use of IR Sensor 5. Connection of LCD display with Arduino and print message 6. Use of servo motor	**Unit-3.0** : Design principles for web connectivity 1. Web communication 2. Protocols for connected devices 3. Message communication 4. Protocols for connected devices. 5. SOAP, REST, HTTP 6. Restful and web Sockets. 7. Internet Connectivity Principles: 8. Internet Connectivity 9. Internet based communication 10. IP addressing in IoT 11. Media Access Control 12. Learning by example	

02CA321.4: Design and implement Sensor Technology and Participatory Sensing.

Approximate Hours

Item	Appx Hours
Cl	12
LI	12
SW	1
SL	1
tal	26

Session Outcomes (SOs)	**(LI)**	**Classroom Instruction (CI)**	**(SL)**
SO4.1 Understanding about the Sensor Technology **SO4.2** Preparation of Participatory Sensing **SO4.3** Understanding about the Industrial IoT and Automotive IoT **SO4.4** Actuator, Sensor data Communication Protocols **SO4.5** Understanding about the Radio Frequency Identification Technology and Wireless Sensor Network Technology.	1. Design an IoT based air pollution control system which detects types of gases present inair. 2. Design an IoT based system which measures the soil moistureand display its unit. 3. Create a smart electricity board using IoT. 4. Wireless connectivity of Arduino with sensors. 5. Connectivity of laser with Arduino 6. Connectivity of keypad with arduino	Unit 4.0 Sensor Technology 1. Participatory Sensing 2. Industrial IoT and 3. Automotive IoT 4. Actuator 5. Sensor data Communication Protocols 6. Radio Frequency 7. Identification Technology 8. Wireless Sensor Network Technology. 9. Application Wireless Sensor Network Technology. 10. Case studies 11. Learn by example 12. Project analysis.	

02CA321.5: Design an IoT Privacy and security solutions.

Approximate Hours

Item	Appx Hours
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**(LI)**	**Classroom Instruction (CI)**	**(SL)**
SO5.1 Understand about the concept of oT Design methodology: **SO5.2** Preparation of Specification-Requirement, Process, Model, service. **SO5.3** Preparation of necessary Functional & Operational View **SO5.4** Understanding about the IoT Privacy and security solutions, Raspberry Pi & Arduino devices **SO5.5** Understanding about the **IoT Case Studies**: Smart City Streetlights control & monitoring.	1. Inhouse weather monitoring system. 2. Agriculture moisture management system.(Smar t Farming) 3. Smart infrared remote-control system for controlling home appliances 4. Compare Raspberry Pi & Arduino 5. Human arm replica using servo motor. 6. Laser audio transmission through laser diode.	**Unit 5.0:** IoT Design methodology: 5.1 Specification 5.2 Requirement 5.3 Process, Model, service 5.4 Functional & Operational View 5.5 IoT Privacy and security solutions 5.6 Raspberry Pi & Arduino devices. **5.7 IoT Case Studies** 5.8 Smart City Streetlights 5.9.Applictions in home security 5.10 Security Concepts. 5.11 Control & monitoring system 512 learn by real life example.	

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning(Sl)	Total hour (Cl+SW+Sl)
02CA321.1: Acquire the knowledge of IoTconcept and its Architecture.	12	12	1	1	26
02CA321.2: Acquire the basic concept ofSoftware defined networking and Machine-to-Machine (M2M).	12	12	1	1	26

02CA321.3: Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	12	12	1	1	26
02CA321.4: Familiarize and understand the basic Sensor data CommunicationProtocols.	12	12	1	1	26
02CA321.5: Smart City Streetlights control &monitoring.	12	12	1	1	26
Total Hours	60	60	5	5	130

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Acquire the knowledge of IoT concept and its Architecture.	01	01	03	05
CO-2	Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).	01	01	03	05
CO-3	Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	-	03	10	13
CO-4	Familiarize and understand the basic Sensor data Communication Protocols.	-	03	10	13
CO-5	Develop the application skills regarding the Smart City Streetlights control & monitoring.	01	03	10	14
Total		03	12	36	50

Legend:R: Remember, U: Understand, A: Apply

The end of semester assessment for Financial Accounting will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition&Year
1	"Internet of Things (A Hand book approach)	Vijay Madisetti & Arshdeeep Bahga	Universal Press	First Edition
2	"The Internet of Things: Connecting Objects"	Hakima Chaouchi	Wiley publication	
3	"MySQL for The Internet of Things"	Charless Bell	A Press publication.	
5	Lecture note provided by Dept. of C A & I T And Science, AKS University, Satna.			

Curriculum Development Team

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CO, PO and PSO Mapping

Course Title: B.C.A.
Course Code: 02CA321
Course Title: Internet ofThings (IOT)

	Program Outcomes												**Program Specific Outcomes**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
Course Outcomes	**Computational information**	**Difficulty Analysis**	**Drawing / Improvement of Solutions**	**Accomplish Investigations of Compound Computing Troubles**	**: Current Implement Procedure**	**Proficient Principles**	**Ultimate Education**	**Mission Administration**	**Announcement Usefulness**	**Public & Ecological Alarm**	**Personality & Group Job**	**Modernization and Private Enterprise**	**An ability to enhance the application of knowledge of theory subjects in diverse fields**	**Develop language proficiency to handle corporate communication demands.**	**Preparing students in various disciplines of technologies such as computer applications, computer networking, software engineering, JAVA, database concepts and programming**	**In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced**
CO1: Acquire the knowledge of IoT concept and its Architecture.	3	2	3	3	2	1	1	1	1	2	1	3	2	2	3	3

CO2: Acquire the basic concept of Software defined networking and Machine-to-Machine (M2M).	2	3	3	3=2	2	2	1	2	1	2	1	3	2	3	2	3
CO3: Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	2	2	2	3	2	2	2	1	1-2	1	1	3	2	2	2	3
CO4: Familiarize and understand the basic Sensor data Communication Protocols.	2	2	3	2	2	2	1	1	1	1	2	3	2	2	3	2
CO5: Smart City Streetlights control & monitoring.	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2

Course Curriculum Map

POs & PSOs /*-No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO: 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO:1,2,3,4	**CO1:** Acquire the knowledge of IoT concept and its Architecture.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	L1.1,1.2,1.3 ,1.4,1.5,1.6	**Unit-1** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11	As Mentioned in Page no._____to _____
PO: 1,2,3,4,5,6,7,8 ,9,10,11,12 PSO:1,2,3,4	**CO2:** Acquire the basic concept of Software defined networking and Machine- to-Machine (M2M).	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	L2.1, 2.2, 2.3, 2.4, 2.5, 2.6,	**Unit-2** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6,2.7,2.8,2.9,2.10,2.11,2.12	
PO: 1,2,3,4,5,6,7,8 ,9,10,11,12 PSO:1,2,3,4	**CO3:** Exposed to various web communication Protocols for connected devices & Message communication Protocols for connected devices.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	L3.1,3.2,3.3 ,3.4,3.5,3.6,	**Unit-3** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO: 1,2,3,4,5,6,7,8 ,9,10,11,12 PSO:1,2,3,4	**CO4:** Familiarize and understand the basic Sensor data Communication Protocols.	SO4.1 SO4.2 SO4.3 SO4.4	L4.1,4.2,4.3 ,4.4,4.5,4.6	**Unit-4** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4,12	
PO: 1,2,3,4,5,6,7,8 ,9,10,11,12 PSO:1,2,3,4	**CO5:** Smart City Streetlights control & monitoring.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	L5.1,5.2,5.3 ,5.4,5.5,5.6	**Unit-5** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Application

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-III

Course Code: 03CA331

Course Title: Data Communication and Computer Network

Pre- requisite: Computer Fundamental

Rationale: Data communication and computer networks have transformed modern society by enabling individuals and organizations to share resources and access information. As technology continues to evolve, networking will play an increasingly important role in how we work, live, and interact with each other.

Course Outcomes:

03CA331.1: Demonstrate the Basic Concepts of Networking and network topology

03CA331.2: Demonstrate the Significance, Purpose and application of transmission media,switching and multiplexing.

03CA331.3: Describe types of networks, their working and network standards.

03CA331.4: Understand OSI Model and its layers.

03CA331.5: Compare networking devices and use routing protocols.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Open Elective	03CA331	Data Communication and Computer Network	4	0	1	1	5	4

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self-Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks
			Class/Home Assignment 5 number3 marks each(CA)	Class Test 2(2 best out	Seminar one(SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
OE	03CA331	Data Communication and Computer Network	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

03CA331.1: Demonstrate the Basic Concepts of Networking and network topology.

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the concept of computer network **SO1.2** Compare various types of network topologies **SO1.3** Apply optimal topology for a network .		**Unit-1.0** Network goals and application. 1.1 Network structure 1.2 Network services 1.3 Example of networks 1.4 Network Standardization 1.5 Networking models: centralized 1.6 distributed and	1. Discuss properties of network topologies. 2. Search about interconnection network.

		1.7 Collaborative. 1.8 Network Topologies: Bus, Star 1.9 Ring, Tree 1.10 Hybrid: 1.11 Selection and 1.12 Evaluation factors.	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Create a poster for network topologies.
ii. Create a poster for network models.

03CA331.2: Demonstrate the Significance, Purpose and application of transmission media, switchingand multiplexing.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**

2.1 Understand the concept media **SO2.2** Use various types of media in network **SO2.3** Demonstrate the use multiplexing and switching	.	**Unit-2.0** Theoretical Basis for Data communication 2.1. Transmission media 2.2. Twisted pair (UTP, STP) 2.3. Coaxial Cable 2.4. Fiberoptics 2.5. Selection and Evaluation factors 2.6. Line of Sight Transmission 2.7. Communication Satellites 2.8. Analog and Digital transmission 2.9. Transmission and switching, 2.10. frequency division and time division multiplexing 2.11. STDM 2.12. Circuit switching, packet switching and message switching	1. Learn Modes of transmission 2. Do Analog to digital conversion 3. Search WDM.

Assignments:

iii. Poster based on guided media.
iv. Poster based on unguided media.

03CA331.3: Describe types of networks, their working and network standards.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2

SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand types of networks and its working **SO3.2** Compare various types of networks **SO3.3** Understand IEEE standards	.	**Unit-3.0** Brief Overview of LAN 3.1. Local Area Network 3.2. Classification of Network 3.3. Brief overview of Wide Area Network (WAN) 3.4. Salient features of LAN 3.5. Differences of LAN & 3.6. WAN with emphasis on: Media, Topology, 3.7. Speed of Transmission, Distance, Cost 3.8. Terminal Handling 3.9. Polling 3.10. Token passing. Contention 3.11. . IEEE Standards: their need and developments 3.12. Case study	1. Search MAN, PAN 2. Write a short note on ISO

Assignments:

i. Poster on comparing LAN, WAN, MAN & PAN.
ii. Explain Token Passing and its importance in networking.
iii. Explain Internet standards.

03CA331.4: Understand OSI Model and its layers.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the concept of OSI Model **SO4.2** Describe functions of layers of OSI Model	.	**Unit-4.0** OSI 4.1. What is an Open System 4.2. Network Architectures 4.3. ISO-OSI Reference Model 4.4. Layers: Application 4.5. Presentation 4.6. Session 4.7. Transport 4.8. Network 4.9. Data Link 4.10. Physical, Addressing 4.11. Media Access Methods, Logical link Control 4.12. Basic algorithms/protocols.	1. Explain functions of each layer.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Poster on OSI Model.

03CA331.5: Compare networking devices and use routing protocols.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	00
SW	02
SL	01
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

SO5.1 Understand the concept of various connecting devices **SO5.2** Demonstrate the use of routing in network **SO5.3** Describe internet and its structure and functions.	.	**Unit-5.0** Network Layer 5.1. Routing 5.2. Fewest-Hops routing 5.3. Type of Service routing 5.4. Updating Gateway routing information 5.5. Brief overview of Gateways 5.6. Bridges and Routers 5.7. Gateway protocols 5.8. routing daemons 5.9. OSI and TCP/IP model, TCP/IP and Ethernet 5.10. The Internet The structure of the Internet 5.11. the internet layers 5.12. Internetwork problems, Internet Standards.	1. Compare internet and intranet. 2. Discuss FTP, DNS, 3. Discuss TELNET.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Compare TCP/IP and OSI layers.
ii. Discuss protocols layer wise.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
03CA331.1: Demonstrate the Basic Concepts of Networking and network topology	12	02	01	15
03CA331.2: Demonstrate the Significance,Purpose and application of transmission media, switching and multiplexing	12	02	01	15
03CA331.3: Describe types of networks,their working and network standards	12	02	01	15
03CA331.4: Understand OSI Model and its layers	12	02	01	15

03CA331.5: Compare networking devices and use routing protocols.	12	02	01	15
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Network goals and application	03	02	03	08
CO-2	Theoretical Basis for Data communication	03	01	05	09
CO-3	Brief Overview of LAN	03	07	02	12
CO-4	OSI	03	05	05	13
CO-5	Network Layer	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held withwritten examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.
Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year

1	Artificial Intelligence: Structures and strategies forComplex Problem Solving	Luger G.F. and Stubblefield W.A.	Addison Wesley	6th edition 2008
2	Artificial Intelligence: A Modern Approach	Russell S. and Norvig P	Prentice-Hall	3rd Edition 2009
3	Lecture note provided by Dept. of CS&E, AKS University, Satna.			

Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Artificial Intelligence	Prof. Bhushan Trivedi	GLS University
2.	Artificial Intelligence: Search Methods for Problem Solving	Prof. Deepak Khemani	IIT Madras
3.	Fuzzy Logic and Neural Networks	Prof. Dilip Kumar Parihar	IIT Kharagpur

Curriculum Development Team

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CO, PO and PSO Mapping

Course Title: B.C.A.
Course Code : 03CA331
Course Title: Data Communication and Computer Network

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
	Computational information	Difficulty Analysis	Drawing / Improvement of Solutions	Accomplish Investigations of Compound Computing Troubles	: Current Implement Procedure	Proficient Principles	Ultimate Education	Mission Administration	Announcement Usefulness	Public & Ecological Alarm	Personality & Group Job	Modernization and Private Enterprise	An ability to enhance the application of knowledge of theory subjects in diverse fields	Develop language proficiency to handle corporate communication demands.	Preparing students in various disciplines of technologies such as computer applications, computer networking, software engineering, JAVA, database concepts and programming	In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced
CO.1: Demonstrate the BasicConcepts of Networking and network topology	2	2	3	3	2	1	1	1	1	1	1	3	2	2	3	3
CO.2: Demonstrate the Significance, Purpose and application of transmission media, switching and multiplexing	2	3	2	3	2	2	1	1	1	1	1	3	2	3	2	3
CO.3: Describe types of networks, their working and network standards	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2	3
CO.4: Understand OSI Model and its layers	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2
CO.5: Compare networking devices and use routing protocols.	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO: 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO:1,2,3,4	CO.1: Demonstrate the Basic Concepts of Networking and network topology	SO1.1 SO1.2 SO1.3		Unit-1.0 Network goals and application 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10	As Mentioned in Page no._____to _____
PO: 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO:1,2,3,4	CO.2: Demonstrate the Significance, Purpose and application of transmission media, switching and multiplexing	SO2.1 SO2.2 SO2.3		Unit-2 Theoretical Basis for Data communication 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO: 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO:1,2,3,4	CO.3: Describe types of networks, their working and network standards various protocols of OSI & TCP/IP model.	SO3.1 SO3.2 SO3.3		Unit-3: Search Methods 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO: 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO:1,2,3,4	CO.4: Understand OSI Model and its layers.	SO4.1 SO4.2		Unit-4 : OSI 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4. 11,4.12,4.13,4.14	
PO: 1,2,3,4,5,6,7,8,9 ,10,11,12 PSO: ,4	CO.5: Compare networking devices and use routing protocols.	SO5.1 SO5.2 SO5.3		Unit5: Network Layer 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5. 11,5.12,5.13,5.14,5.15	

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Semester-III

Course Code 03CA332

Course Title Optimization Techniques

Pre-requisites Basic Math's concept

Rationale related fields The rationale behind discrete mathematics is grounded in its practical applications to computer science and

Course Outcome

03CA332.1 Formulate real life problems into linear programming problem.

03CA332.2: Apply the simplex method to find an optimal vector for the standard linear programming problemand the corresponding dual problem.

03CA332.3: Find optimal solution of transportation.

03CA332.4: Formulate and solve linear programming model of two-person zero sum game.

03CA332.5: Solve nonlinear programming problems using Kuhn Tucker conditions.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
Open Elective	03CA332	Optimization Techniques	4	0	2	1	7	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategiesi.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

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SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ ESA)
OE	03CA 332	Optimization Techniques	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

03CA332.1: Formulate real life problems into linear programming problem.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2

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SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understanding Basic concepts of linear programming problem. **SO1.2** Explain Simplex method **SO1.**3 discuss Two-phase method **SO1.4** define Big-M method		**Unit-1. Linear Programming Problem**: 1. Basic concepts of linear programming problem 2. Simplex method and 3. Example 4. Algorithm 5. Learn by example 6. Artificial variables technique 7. Learn by example 8. Two-phase method 9. Learn by example 10. Big-M method 11. Learn by example 12. Case study.	1. Basic concepts of linear programming problem.

SW-1 Suggested Sessional Work (SW):

a. Assignments:-

(1) Basic concepts of linear programming problem.

(2) Two-phase method and Big-M method.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

03CA332.2: Apply the simplex method to find an optimal vector for the standard

linearprogramming problem and the corresponding dual problem.

Approximate Hours

Item	AppXHrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 define dual problem. **SO2.2 discuss** Primal-dual relationships. **SO2.3** To learn about Dual simplex Method.	.	**Unit-2** : **Duality**: 1. Definition and 2. formulation of the dual 3. problem 4. Primal-dual 5. Relationships 6. Economic interpretation of the dual 7. Learn by example 8. Dual simplex Method 9. Learn by example 10. Sensitivity analysis 11. Learn by example 12. Case study	1. Primal-dual relationships. 2. Economic interpretation of the dual.

SW-2 Suggested Sessional Work (SW):

a. Assignments:-

(1) Definition and formulation of the dual problem.
(2) Economic interpretation of the dual and dual simplex Method.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

Quiz, Class Test.

03CA332.3:Find optimal solution of transportation.

Approximate Hours

Item	AppXHrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 To Understand Mathematical model **SO3.2** To learn Balanced and unbalanced problems. **SO3.3 Explain** Least cost method. **SO3.4 To** Understand Algorithm for solving transportation problem.	.	**Unit-3 : Transportation Problems**: **3.1** Mathematical model **3.2** Balanced and **3.3** unbalanced problems **3.4** Degeneracy **3.5** Optimality conditions **3.6** Methods to find starting solution and **3.7** optimal solution **3.8** Algorithm for solving transportation problem **3.9** Northwest-Comer method **3.10** Least cost method **3.11** Vogel approximation method for determination of starting basic solution. **3.12** learn by example	1. Algorithm for solving transportation problem. 2. Methods to find starting solution and optimal solution.

SW-3 Suggested Sessional Work (SW):

a. Assignments:-

(1) Balanced and unbalanced problems.
(2) Algorithm for solving transportation problem.
(3) Methods to find starting solution and optimal solution.
(4) Vogel approximation method for determination of starting basic solution.

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):
Quiz, Class Test.

03CA332.4: Formulate and solve linear programming model of two person zero sum game.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	2
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (Cl)	Self-Learning (SL)
SO4.1 To Understand Network Analysis. **SO4.2** To learn Critical Path Method (CPM). **SO4.3** To understand Advances of network. **SO4.4** Explain PERT calculation.	.	**Unit-4 Network Analysis**: 4.1 Constraints in networks 4.2 Learn by example 4.3 Construction of network 4.4 Learn by example 4.5 Critical Path Method (CPM) 4.6 Learn by example 4.7 PERT calculation 4.8 Learn by example 4.9 Resource leveling 4.10 network techniques 4.11 vances of network (PERT/CPM). 4.12 Case study.	1. Critical Path Method. 2. Advances of network.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

(1) Construction of network, PERT calculation.

(2) Resource leveling by network techniques, Advances of network (PERT/CPM).

b. Mini Project:

Oral presentation, Poster presentation, Power Point Presentation.

c. Other Activities (Specify):

NA

03CA332.5: Solve nonlinear programming problems using KuhnTucker conditions.

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 To understand Game Theory. **SO5.2** To learn about Games with mixed strategies. **SO5.3** Explain Kuhn-Tucker conditions. **SO5.4** define Non-negative constraints.		**Unit 5 Game Theory:** 5.1 Formulation of two person zero sum games. 5.2 Learn by example 5.3 Solving two person zero sum games 5.4 Learn by example 5.5 Games with mixed strategies 5.6 Graphical solution procedure 5.7 Learn by example 5.8 Linear programming solution of games 5.9 Non-Linear programming techniques. 5.10 Kuhn-Tucker	1. Formulation of two person zero sum games. 2. Linear programming solution of games

		conditions 5.11 Non-negative constraints	
		5.12 Case study.	

SW-5 Suggested Sessional Work (SW):

a. Assignments:-

(1) Formulation of two person zero sum games, Solving two person zero sum games.

(2) Linear programming solution of games.

(3) Non-Linear programming techniques and Kuhn-Tucker conditions.

Mini Project: NA

Other Activities (Specify): NA

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
03CA332.1: Formulate real life problems intolinear programming problem.	12	2	1	15
03CA332.2: Apply the simplex method to find an optimal vector for the standard linearprogramming problem and the corresponding dual problem.	12	2	1	15
303CA332.3: Find optimal solution of transportation.	12	2	1	15
03CA332.4: Formulate and solve linear programming model of two person zerosum game.	12	2	1	15

03CA332.5: Solve nonlinear programming problems using Kuhn Tucker conditions.	12	2	1	15
Total Hours	60	10	5	76

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Linear Programming Problem**	03	01	01	05
CO-2	**Duality**	02	02	01	05
CO-3	**Transportation Problems**	03	07	05	15
CO-4	**Network Analysis**	04	06	05	15
CO-5	**Game Theory**	03	04	03	10
Total		15	20	15	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT industry

7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Linear Programming and Network Flows.	Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali.	John Wiley and Sons, India,	2nd Ed. 2004
2	Introduction to Operations Research,	F.S. Hillier and G.J. Lieberman	Tata McGraw Hill, Singapore	9th Ed 2009
3	Operations Research	Nita H. Shah, Ravi M. Gor and HardikSoni	PHI Learning Pvt. Ltd.	2007

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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

CO, PO and PSO Mapping

Course:B.CA.

Course Code: 03CA332

Course Title: Optimization Techniques

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability:	Ethics	Individual and team work:	Communication:	Project management and finance:	Life-long learning	The ability toapply technical & engineering knowledge for production quality cement	Ability to understandthe day to plant operational problems ofcement manufacture	Ability to understandthe latest cement manufacturing technology.	Ability to use the research based innovative knowledge for SDGs
CO1 : Formulate real life problems into linear programming problem.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1
CO 2 : Apply the simplex method to find an optimal vector for the standard linear programming problem and the corresponding dual problem.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1

CO3 : Find optimal solution of transportation. .	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**
CO 4: Formulate and solve linear programming model of two person zero sum game.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**
CO 5:. Solve nonlinear programming problems using KuhnTuckerconditions.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1: Formulate real life problems into linear programming problem.**	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1. 1.1,1.2,1.3,1.4,1.5,	As mentionedin page number 2 to 6
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2: Apply the simplex method to find an optimal vector for the standard linear programming problem and the corresponding dual problem.**	SO2.1 SO2.2 SO2.3		Unit-2 2.1, 2.2, 2.3, 2.4, 2.5,	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3 : Find optimal solution of transportation.**	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 : 3.1, 3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 4: Formulate and solve linear programming model of two person zero sum game.**	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 : 4.1, 4.2,4.3,4.4,4.5,4.6,	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 5:. Solve nonlinear programming problems using KuhnTucker conditions.**	SO5.1 SO5.2 SO5.3 SO5.4		Unit 5: 5.1,5.2,5.3,5.4,5.5,5.6	

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Semester-IV

Course Code: **0EN401**

Course Title : Entrepreneurship Development

Pre-requisite: Student should have basic knowledge of computer

Rationale: Computer ethics is essential because it guides ethical behavior in the digital age, addresses ethical dilemmas in technology use, and promotes the responsible and ethical development, deployment, and use of technology for the benefit of individuals and society as a whole.

Course Outcomes:

0EN401.1: student will Advance their skills in customer development, customer validation, competitive Analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world Problems and projects.

0EN401.2: Mobilize people and resources

0EN401.3: Increase their awareness and deliberately practice the skills and disciplines necessary to Increase confidence and agency.

0EN401.4: Demonstrate knowledge of current information, theories and models, and techniques and Practices in all of the major business disciplines including the general areas of Accounting and Finance, Information Technologies, Management, Marketing, and Quantitative Analysis.

0EN401.5: the end of this chapter the student will Increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Skill Enhancement	0EN401	Entrepreneurship Development	2	0	2	1	5	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback

of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test2 (2 best out of 3) 10 marks each (CT)	Seminarone (SA)	Class Activityany one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA + ESA)
SE	0EN401	Entrepreneurship Development	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

0EN401.1: Advance their skills in customer development, customer validation, competitive analysis, and iterationwhile utilizing design thinking and process tools to evaluate in real-world problems and projects.

Approximate Hours

Item	Appx Hrs
Cl	6
LI	0
SW	2
SL	1
Total	9

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Session Outcomes(SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction(CI)**	**Self-Learning(SL)**
SO1.1To understand the Theories of Entrepreneurship SO1.2 Explain Categories of Entrepreneurship SO1.3 To Know the challenges and process of Entrepreneurship SO1.4 Explain Startups and its types .		**Unit-1**Introduction Entrepreneurship. 1.1. Theories of Entrepreneurship 1.2. Theory of Achievement Motivation And Theory of Entrepreneur as a risk taker 1.3. Theory of Creative destruction 1.4. Entrepreneurship Categories: by chance, need choice, force; Myths. 1.5. challenges and process of Entrepreneurship 1.6. Definition of Startups and types of Internet based startups	1. Learn Internet based startups

SW-1 Suggested Sessional Work (SW):

- **Assignments:**
  - Discuss about Entrepreneurship Categories: by chance, need choice, force; Myths
- **Presentation**

0EN401.2**:** Mobilize people and resources

Approximate Hours

Item	Appx Hrs
Cl	6
LI	0
SW	2
SL	1
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 To Understand the Difference between Scientist, Entrepreneur, and Manager. **SO2.2** Difference between idea and opportunity SO2.3 To understand Link between creativity and innovation SO2.4 To know Types of innovation		**Unit-2** **2.1.** Difference between Scientist, Entrepreneur, and Manager. **2.2.** Characteristics of Entrepreneur a. ,Entrepreneurial Mindset and its enablers 2.3. Difference between idea and opportunity 2.4. Link between creativity and innovation 2.5. character of creative climate with cases of world most creative companies 2.6. Types of innovation, link between technology and innovation.	1. Learn about the link between technology and innovation.

SW-2 Suggested Seasonal Work (SW):

- **Assignments:**
  - Discuss Link between creativity and innovation
- Pictorial representation of different character of creative climate?

0EN401.3: Increase their awareness and deliberately practice the skills and disciplines necessary to increaseconfidence and agency.

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Approximate Hours

Item	Appx Hrs
Cl	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 To understand Opportunity Analysis SO3.2know Opportunity Evaluation Process SO3.3 Develop Idea to Opportunity Mapping SO3.4 To understand Business Model		**Unit-3:** 3.1. Opportunity Analysis 3.2. Opportunity sighting 3.3. Market Driven, People Driven 3.4. Opportunity Evaluation Process 3.5. Approaches to 3.6. ideation, Ideation, techniques 3.7. Idea to Opportunity Mapping 3.8. Business Model – Functions and Factor of Business Model	**1.** **l**earn Functions and Factors of Business Model

SW-2: Suggested Seasonal Work (SW):

- **Assignments:**
  - Explain Opportunity sighting, Opportunity sighting
- **Presentation**

0EN401.1.4**:** Demonstrate knowledge of current information, theories and models, and techniques and practicesin all of the major business disciplines including the general areas of Accounting and Finance, Information Technologies, Management, Marketing, and Quantitative Analysis.

Approximate Hours

Item	Appx Hrs
Cl	6
LI	0
SW	2
SL	1
Total	9

Session Out comes(SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 To Understand Pitching, types of pitch **SO4.2** To understand Aspects of funds, types of capital, **SO4.3** Explain the types and nature of investors **SO4.4** To understand the three financial statements **SO4.5** To Understand Business Plan its types and different sections.	.	**Unit-4 : MEMORY SYSTEM:** 4.1 Introduction to Pitching, types of pitch 4.2 Aspects of funds, types of capital, concept of break-even, sources of funds 4.3 types and nature of investors, 4.4 Understanding of the three financial statements: 4.5 profit and loss account, balance sheet, cash flow statement. 4.6 Introduction to Business Plan its types and different sections.	1. Prepare a Business Plan

SW-4 Suggested Seasonal Work (SW):

- **Assignments:**
- **(i)** Write the process of break-even
- **Presentation**

0EN401.5: At the end of this chapter the student will Increase their awareness and deliberately practice the skillsand disciplines necessary to increase confidence and agency.

Approximate Hours

Item	Appx Hrs
Cl	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 To understand collaboration **SO5.2** To understand networking **SO5.3** To know about Distinction between data, information, intelligence and knowledge **SO5.4 To** Understand Intellectual Property		**Unit5:** **5.1.** Why Collaborate, types and approaches of collaboration **5.2.** Why Network: places of networking **5.3.** Networking: stages of networking, good networking practices **5.4.** Distinction between data, information, intelligence and knowledge **5.5.** Components of Knowledge **5.6.** Intellectual Property: Its life cycle.	1. Learn life cycle Intellectual Property

SW-5Suggested Seasonal Work (SW):

- **Assignments:**
  - Explain in detail about Networking: stages of networking, good networking practices
- Presentation:
- **Other Activities (Specify):**
  - Group discussion of important topics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour(Cl+SW+Sl)
0EN401.1 At the end of this chapter the student will Advance their skills in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world problems and projects	6	2	1	**9**
0EN401.2 At the end of this chapter the studentwill Mobilize people and resources	6	2	1	**9**
0EN401.**3** At the end of this chapter the student will Increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency.	6	2	1	**9**
0EN401.**4** At the end of this chapter the student will Demonstrate knowledge of current information, theories and models, and techniques and practices in all of the major business disciplines including the general areas of Accounting and Finance, Information Technologies, Management, Marketing, and Quantitative Analysis.	6	2	1	**9**

0EN401.5. the end of this chapter the student will Increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency.	6	2	1	**9**
Total Hours	30	10	5	45

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Unit-1	03	02	03	08
CO-2	Unit-2	03	01	05	09
CO-3	Unit-3	03	07	02	12
CO-4	Unit-4	03	05	05	13
CO-5	Unit-5	03	02	03	08
Total		15	17	18	50

legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for autonomous system for Entrepreneurship development will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Khanka, S.S	Entrepreneurial Development. India,	. S. Chand Limited	2006
2	Kumar, S. Anil	Entrepreneurship Development. India,	New Age International,	2008.

Curriculum Development Team

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5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
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COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 0EN401
Course Title: Entrepreneurship Development

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CT101 At the end of this chapter the student will Advance their skills in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

tools to evaluate in real-world problems and projects																	
CT102 At the end of this chapter the student will Mobilize people and resources	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CT103 At the end of this chapter the student will Increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CT104 At the end of this chapter the student will Demonstrate knowledge of current information, theories and models, and techniques and practices in all of the major business disciplines including the general areas of Accounting and Finance, Information Technologies, Management, Marketing, and Quantitative Analysis.	-	-	-	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1:Advance their skills in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world problems and projects	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Mobilize people and resources	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Demonstrate knowledge of current information, theories and models, and techniques and practices in all of the major business disciplines including the general areas of Accounting and Finance, Information Technologies, Management, Marketing, and Quantitative Analysis.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3:** At the end of this chapter the student will Increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 I5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-IV

Course Code: 01CA411

Course Title : Database Management Systems Using PL/SQL

Pre-requisite: Student should have basic knowledge of components and architecture of digital computer system

Rationale: The students should possess foundational understanding about the basic components of digital Computer system. This encompasses familiarity with the operational elements of digital computer system. Additionally, Students ought to acquire fundamental insights into different types of computers, their applications.

Course Outcomes:

01CA411.1: Explain the features of database management systems and relational database.

01CA411.2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.

01CA411.3: Create and Populate A RDBMS for A Real-Life Application, With Constraints and Keys, Using SQL

01CA411.4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.

01CA411.5 Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credit (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Major	01CA411	Database Management Systems Using PL/SQL	4	4	1	1	10	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Major	01CA411	Database Management Systems Using PL/SQL	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA +CAT+AT)		
Major	01CA411	Database Management Systems Using PL/SQL	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

A K S University

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01CA411.1: Explain the features of database management systems and relational database.

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction(CI)**	**Self-Learning (SL)**
SO1.1 Define DBMS Discuss about the Characteristics. **SO1.2 Explain** Architecture andModeling **SO1.3Explain**1 Entity Relationship(ER) Model **SO1.4** Enhanced Entity Relationshi (EER) Model **SO1.**5 **Explain** Generalization	LI1.1. Draw ER Model and Relational Model for a given database. LI1.2. Show ER to Relational Model reduction. LI1.3. Create a table and use select command. LI1.4. Example of floating-point representation. LI1.5. Example of aggregation LI1.6. Example of Generalization	**Unit-1. Introduction to DBMS:(13 Lectures)** 1.4 Why database? Characteristics of data in database Functional Units. 1.5 What are database advantages of DBMS?, 1.6 Conceptual, physical and logical database models. 1.7 Role of DBA, Database design 1.8 Components of ER-model,ER modeling symbols. Relationships. 1.9 An introduction, Superclassand subclass entity types. Specialization, Generalization. 1.10 Attribute inheritance, Categorization& Aggregation. 1.11 DBMS, DBA, Entity Relationship (ER), S EER, Superclass 1.12 Subclass, Specialization Floating-Point Representation, Generalization, Categorization & Aggregation.4	1. Why we are using database. And how much it's important.

SW-1Suggested Sessional Work (SW):

a. Assignments:

(i) Explain Components of ER-model and ER modeling symbols.

b. **Presentation.**
c. **Pictorial representation of ER-Model:**

01CA411.2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries InRelational Algebra.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Fundamental Concepts. **SO2.2** To learn Normalization Process **SO2.3**To understand Transforming a Conceptual Model to a Relational Model. **SO2.4** Transforming Relationships. **SO2.**5 Aggregated ObjectSets.	LI2.1. Creation of Database with proper constraints (Pk, Fk etc). LI2.2. Insert into database using different types of insert statements. LI2.3. To displaythe table after creation and insertion we use the following syntax: select *from <table nanze> LI2.4. Example of second normal form LI2.5. Example of BCNf LI2.6. Example of 4^{NF}	Unit-2 **The Relational Data Model** **(11 Lectures)** **2.1** Relations, Null Values, **2.2** Keys, Foreign Keys. **2.3** Integrity Constraints Entity Integrity & Relational Integrity .First Normal Form, Functional Dependencies, Second Normal Form, Third Normal Form. **2.6** Boyce-Codd Normal Form (BCNF), Fourth Normal Form; Other Normal Forms Fifth Normal Form & Domain/Key Normal Form. **2.7** Transforming Objects Sets and Attributes **2.8** Transforming Models without External Keys. **2.9** Transforming Specialization and	1. Solve Recursive Relationship.

		Generalization Object Sets. **2.10** One-One Relationships. **2.11** One-Many Relationships, Many-Many Relationships **2.12** Transforming Aggregated Object Sets, Transforming Recursive Relationships.	

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Design BCNF

b. Presentation

c. Pictorial representation of different type of Keys:

01CA411.3: Create and Populate A RDBMS for A Real-Life Application, With Constraints and Keys, Using SQL

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3. 1 Relational Algebra and Calculus Relational Algebra. SO3.2 to understand Relational Calculus . SO3.3 to understand the The Existential Quantifier	1. Applying different constraints check, not null, etc. 2. Alter table: add column, remove	Unit-3: Relational database implementation: 3.1 Union, 3.2 Intersection 3.3 Product, 3.4 Select, 3.5 Project, Join Natural, 3.6 Theta & 3.7 Outer Join 3.8 Divide,	i. Explain Target list, Existential Quantifier,

	column, add constraint, remove constraint	3.9 Assignment. 3.10 Target list & Qualifying Statement, 3.11 The Existential Quantifier, 3.12 The Universal Quantifier	

SW-3 Suggested Seasonal Work (SW):

a. **Assignments:**
   (i) **Explain Join Natural, Theta & Outer Join.**
b. **Presentation**
c. **Pictorial representation of different Relational Calculus:**

01CA411.4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Explain Relational Implementation with SQL,Relational Implementations. SO4.2 To An Overview. Schema and Table Definition. SO4.3 Explain Data Manipulation SO4.4 Explain Relational	LI4.1. Selection of rows and columns, LI4.2. renaming columns, LI4.3. use of distinct keyword LI4.4. 2. Select clause is used to list the attributes desired in the result of a query. It corresponds to the projection operation of the relational algebra: Eg. select EMPLOYEE	4.1 Unit-4 : Relational database implementation 4.2 (12 Lectures) 4.3 Schema definition, 4.4 Data types & domains, Defining Tables . 4.5 Simple Queries (SELECT, FROM,	i. Define Data Manipulation

Algebra Operations SO4.5 Explain Using SQL with Data Processing Languages	LI4.5. 3. SQL provides a case construct which we canuse to perform both theupdate with a single update statement avoiding the problem with the order of updates. LI4.6. Use of EXISTS and NOT EXISTS operators.	WHERE), 4.6 Multiple-Table Queries, Subqueries, Correlated Subqueries. 4.7 EXISTS and NOT EXISTS operators. 4.8 Built-ln Functions (SUM, AVG, COUNT, MAX, and MIN). 4.9 GROUP BY and HAVING clause 4.10 Built-In Functions 4.11 UNION, INTERSECT, EXCEPT, JOIN.Database Change Operations. 4.12 INSERT, UPDATE, DELETE. View Definition, Restrictions on View Queries and Updates.	

SW-4 Suggested Sessional Work (SW):

Assignments: a.

(i) Database Change Operation.

b. Presentation

c. Pictorial representation of different Built-ln Functions

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01CA411.5: Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.

Item	Appx. Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understand Physical Access of the Database. Physical Storage Media **SO5.2 Explain** Disk Performance Factors **SO5.3 Explain** Data Storage Formats on Disk **SO5.4** Discuss Input/output Management. File Organizing and Addressing Methods. **SO5.5 Discuss** Hashing	LI5.1. Create a personalized collection of relation that is better user's intuition than is logical model I5.2. Creation ofViews I5.3. Eample of sequence I5.4. Example of join I5.5. Example of groupby and having I5.6. Example of Built-ln Functions	**Unit5: INPUT-OUTPUT:** (12 Lecture) 5.1 Secondary Storage, 5.2 Physical Storage Blocks, 5.3 : Access Motion Time, Head Activation Time, 5.4 Rotational Delay, Data Transfer Rate, 5.5 Data Transfer Time. 5.6 Track Format, Record Format—Fixed-Length Records & Variable-Length Records, 5.7 Sequential File Organization, Indexed 5.8 Sequential File Organization 5.9 Direct File Organization. 5.10 Static Hash Functions and 5.11 Dynamic Hash Functions Synchronization,	1. Disk Performance Factors 2. Sequential File Organization

	najne> as <query expression>	5.12 By example	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Indexed Sequential File Organization.

b. Presentation:

c. Other Activities (Specify): Group discussion on important topics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
01CA411.1: Explain the features of database management systemsand relational database.	12	1	1	14
01CA411.2: Design Conceptual Models of a Database Using ER Modelling for Real Life Applications and Construct Queries inRelational Algebra.	12	1	1	14
01CA411.3: Create and Populate A RDBMS for A Real-LifeApplication, With Constraints and Keys, Using SQL	12	1	1	14
01CA411.4: Retrieve Any Type of Information from A Database byFormulating Complex Queries In SQL.	12	1	1	14
01CA411.5: Analyses the Existing Design of a Database Schema and Apply Concepts of Normalization to Design an Optimal Database.	12	1	1	14
Total Hours	60	5	5	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Unit-1	03	02	03	08
CO-2	Unit-2	03	01	05	09
CO-3	Unit-3	03	07	02	12
CO-4	Unit-4	03	05	05	13
CO-5	Unit-5	03	02	03	08
Total	221	15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for autonomous system for AI and DS will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources: Books:

S. No.	Title	Author	Publisher	Edition & Year
1	SQL, PL/SQL – The Programming Language of Oracle	Ivan Bayross	Prentice Hall	1 Dec 2010
2	SQL & PL / SQL for Oracle 11g Black Book	P.S. Deshpande	Pearson Education	7 Jul 2011

	Mastering Oracle SQL	Sanjay Mishra	Morgan Kauffmann Publishers	17 Apr 17 Apr 2002 2002

A. Alternative NPTEL/SWAYAM/MOOC Course (if any): NA

Curriculum Development Team

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7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 01CA411
Course Title: Database Management Systems Using PL/SQL

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Explain the features of database management systems and relational database.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

CO3: Create and Populate A RDBMS for A Real-Life Application, With Constraints and Keys, Using SQL	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO5 Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Explain the features of database management systems and relational database.	SO1.1 SO1.2 SO1.3 SO1.4	1,2,3,4,5,6	UNIT – I:STRUCTURE OF COMPUTERS: 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Design Conceptual Models Of A Database Using ER Modelling For Real Life Applications And Construct Queries In Relational Algebra.	SO2.1 SO2.2 SO2.3 SO2.4	1,2,3,4,5,6	UNIT – II:LOGIC GATES 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Create and Populate A RDBMS for A Real-Life Application, With Constraints and Keys, Using SQL	SO3.1 SO3.2 SO3.3 SO3.4	1,2,3,4,5,6	UNIT – III:BASIC COMPUTER ORGANIZATION 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Retrieve Any Type Of Information From A Database By Formulating Complex Queries In SQL.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	1,2,3,4,5,6	Unit-4:MEMORY SYSTEM 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Analyses The Existing Design Of A Database Schema And Apply Concepts Of Normalization To Design An Optimal Database.	SO5.1 SO5.2 SO5.3 SO5.4	1,2,3,4,5,6	Unit-5:MULTIPROCESSORS 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-IV

Course Code: **02CA421**

Course Title: Internet Applications using Java Programming Operating System

Pre-requisite: Student should have a basic understanding of Fundamental of Computer.

Rationale: The study of this subject will develop understanding of Java core concepts. Java is an object-oriented language that is best suited for Internet applications. All these concepts will help students to develop elementary internet applications using JAVA that solve real world problems.

Course Outcomes:

02CA421.1: Able to use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
02CA421.2: Understand and apply the concepts of Inheritance and Interfaces.
02CA421.3: Learn and apply applet programming to create basic web pages.
02CA421.4: Understand the Java event handling model and apply to create interactive web pages.
02CA421.5: Able to implement I/O operations and connect to database to solve real world problems.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Minor	02CA421	Internet Applications using Java Programming	4	4	1	1	10	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecture(L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Minor	02CA421	Internet Applications using Java Programming	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Minor	02CA421	Internet Applications using Java Programming	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

A K S University

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Curriculum of B.C.A. Program

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02CA421.1: Able to use an integrated development environment to write, compile, run, and test simpleobject-oriented Java programs.

Approximate Hours

Item	Appx. Hrs.
CI	15
LI	12
SW	1
SL	1
Total	29

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
O1.1 Understand about language and programming paradigm **SO1.2** Understand OOPs concept, how java works. **SO1.3** Understand the concept of PATH and CLASS PATH **SO1.4** Learn about structure, compilation and execution of a Java program and role of JVM **SO1.5** Learn about data sets, operators and expressions **SO1.6** Learn about operators and expressions. **SO1.7** Learn about decision control statements and looping statements. **SO1.8** Understand the concepts of Classes. **SO1.9** Learn to create Objects and methods **SO1.10** Understand the concepts of	1. Write a program to print numbers in words using Nested if and Switch Case. 2. Write a program called PassFail which prints "PASS" if the int variable "mark" is more than or equal to 50; or prints "FAIL" otherwise 3. Write a program called OddEven which prints "Odd Number" if the int variable "number" is odd, or "Even Number" otherwise. 4. Write a Program to find sum & average of 10 no. using arrays. 5. Example of classes and object 6. Example of constructor	**Unit-1.0 The Java Environment** 1.1 History and features of java, C++ Vs java. 1.2 OOPs concept, how java works. 1.3 The concept of PATH and CLASS PATH. 1.4 A simple program, its compilation and execution, JAVA Program Structure, Java Virtual Machine concepts 1.5 Java platform overview, Primitive data types, variables and constants. 1.6 Operators, expression. 1.7 Statement-branching, looping and jumping, labeled statements. 1.8 Classes, objects and methods: defining a class, adding variables and methods. 1.9 Creating objects, constructor 1.10 Instances, field and methods initialization	1. Use of algorithms for develop program. 2. Create program in Java use of decision and looping statement.

Constructor **SO1.11** Understand Memory allocation and garbage collection in java **SO1.12** Learn about keywords. **SO1.13** Learn about arrays **SO1.14** Learn about String and String buffer classes **SO1.15** Learn about Wrapper classes, using the JDK tools.		by constructors, Copy constructor, 1.11 Memory allocation and garbage collection in java. 1.12 Java keywords, access methods 1.13 Arrays 1.14 String and String buffer classes. 1.15 Wrapper classes, using the JDK tools.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Create a program in Java to check the input no is prime or not.
2. Create a program in Java to print a factorial of given no.

b. Mini Project:

Java Program to Make a Simple Calculator Using switch...case.

c. Other Activities (Specify):

NA

02CA421.2: Understand and apply the concepts of Inheritance and Interfaces.

Approximate Hours

Item	Appx. Hrs.
CI	11
LI	12
SW	1
SL	1
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

O2.1 Understand about Inheritance. **SO2.2** Learn about method overloading **SO2.3** Learn about abstract classes. **SO2.4** About Interface and implementing an interface **SO2.5** Create programs implementing an Interface **SO2.6** Learn about multithreading. **SO2.7** Understand the lifecycle of a thread. **SO2.8** Learn creating a thread **SO2.9** Learn thread synchronization. **SO2.10** Understand Thread	1. Write a program to display reverse of a digit no. usingarray. 2. Write a program to display grade according to the marks obtained by the student. 3. Find the factorial of number if number is given by user using command line argument.	**Unit-2.0 Inheritance and Interfaces** 2.1 Inheritance basics, Super class, Sub-class. 2.2 Method overloading 2.3 Abstract classes. 2.4 Defining an interface, implementing & applying interfaces, variables in interfaces 2.5 Create programs implementing an Interface 2.6 Extending interfaces, Multithreading and Exception Handling: Basic idea of multithreaded programming 2.7 The lifecycle of a thread 2.8 Creating thread with the thread class and runnable	1. Study and practice implementing interfaces. Study exception handling
scheduling. **SO2.11** Learn exception handling.	4. Write a program to print Fibonacci series. 5. Example of thread using Thread clas 6. Example of thread using Runnable interface.	interface. 2.9 Thread synchronization 2.10 Thread scheduling 2.11 Basic idea of exception handling: 2.12 The try, catch and throw, throws	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Write a program in Java to show method overloading.
2. Write a program in Java implementing the concept of multi-threading.

b. Mini Project:

NA

c. Other Activities (Specify):

NA

02CA421.3: Learn and apply applet programming to create basic web pages.

Approximate Hours

Item	Appx. Hrs.
CI	11
LI	12
SW	1
SL	1
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
3.1 Learn about Applets. **SO3.2** Learn creating applets. **SO3.3** Understand applets and alignment. **SO3.4** Understand Java security, passing parameter to applets, Aligning the Display **SO3.5** Learn basic HTML Tags **SO3.6** Learn how to take inputs from the user. **SO3.7** Understand class hierarchy and basic user interface components. **SO3.8** Understand basic user interface components. **SO3.9** Understand basic user interface components. **SO3.10** Understand various types of layouts. **SO3.11** Understand various types of layouts.	1. Write a program to display tables from 2 to10. 2. Write a program to take an input from user and check given number is prime or not. 3. Write a program to implement method overriding. 4. Write a program to convert given string into. Uppercase and lowercase and get the length of string using array. 5. Example of Label and Button 6. Example of Checkbox and radio button	**Unit-3.0 Applet Programming** 3.1 Local and Remote Applets, Applet Vs Application 3.2 Creating and executing java applets 3.3 Inserting applets in a web page 3.4 Java security, passing parameter to applets, Aligning the Display 3.5 HTML Tags & Applet Tag 3.6 Getting Input from User 3.7 The class hierarchy of window fundamentals; The basic user interface components Label, Button 3.8 Check Box, Radio Button 3.9 Choice menu, Text area, scroll list, Scroll bar 3.10 Frame, Layout managers-flow layout 3.11 Grid layout, Border layout, Card layout	1. Study about Applet. 2. Create web pages using applets.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Create a web page using applets?
2. Differentiate between Local and Remote applets?

b. Mini Project:

Create the homepage and Contact Us page for the University website.

c. Other Activities (Specify):NA

02CA421.4: Understand the Java event handling model and apply to create interactive web pages.

Approximate Hours

Item	Appx. Hrs.
CI	13
LI	12
SW	1
SL	1
Total	27

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
O4.1 Understand the basic concepts of Event handling model in Java. **SO4.2** Understand the basic concepts of Event handling model in Java. **SO4.3** Learn about event class hierarchy. **SO4.4** Learn about event class hierarchy. **SO4.5** Learn about Adapter classes, Event classes, action Event. **SO4.6** Understand about various types of Events supported by Java. **SO4.7** Understand about various types of Events supported	1. Example of Menu 2. Example Layout 3. Write a programto overload volume method to find out volume of cube and cuboid. 4. Write a programto design a class using abstract Methods and Classes. 5. Write a programto implement multiple inheritance by using Interface. 6. Write a program to create a package of your name and use that package in a class.	**Unit-4.0 The Java Event Handling Model** 4.1 Java's event delegation model ignoring the event 4.2 Self- contained events, Delegating events 4.3 The event class hierarchy 4.4 The relationship between interface, methods called, parameters and event source 4.5 Adapter classes, Event classes, action Event 4.6 Adjustment Event, Container Event 4.7 Focus Event, Item Event 4.8 Event, Mouse Event 4.9 Text Event, Window Event 4.10 Networking basics 4.11 Networking classes and interfaces 4.12 Using java.net package	1. Study about Event Handling in Java.

by Java. **SO4.8** Understand about various types of Events supported		4.13 TCP/IP and datagram programming	
by Java. **SO4.9** Understand about various types of Events supported by Java. **SO4.10** Learn about basics of networking. **SO4.11** Learn about networking related Java classes. **SO4.12** Learn about TCP/IP and datagram programming. **SO4.13** Learn about TCP/IP and datagram programming.			

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Implement event handling using Java.
2. Give brief overview of TCP/IP and explain some of the events supported by Java.

b. Mini Project:

NA

c. Other Activities (Specify):

NA.

02CA421.5: Able to implement I/O operations and connect to database to solve real world problems.

Approximate Hour

Item	Appx. Hrs.
CI	10
LI	12
SW	1
SL	1
Total	24

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Learn about Java i/o, **SO5.2** Learn about Directories, stream classes. **SO5.3** Understand Byte Stream. **SO5.4** Learn about Input and Output stream. **SO5.5** Learn to access files. **SO5.6** Learn about buffered reader and writer. **SO5.7** Understand database connectivity. **SO5.8** Understand database connectivity. **SO5.9** Learn about JDBC and its classes. **SO5.10** Learn about JDBC and its classes.	1. Write a program to implement parameterized constructor with default argument. 2. Define an exception called "Marks out of Bound" exception that is thrown if the entered marks are greater than 100. 3. Develop a simple real life application to illustrate the use of multithreading 4. Design an applet that takes three numerical values as input from the user and then Displays the largest of those three numbers onthe screen. 5. Java dataset connectivity example. 6. Example of file handling in java	**Unit-5.0 Input/Output and JDBC** 5.1 Exploring Java i/o. 5.2 Directories, stream classes. 5.3 The Byte Stream: Input stream, output stream 5.4 file input stream, file output stream, print stream 5.5 Random access file, the character streams 5.6 Buffered reader, buffered writer, print writer, serialization 5.7 JDBC-ODBC bridge, The connectivity model; The driver manager 5.8 Navigating the result set object contents 5.9 java.sql Package, The JDBC exception classes 5.10 Connecting to Remote database	1. Study about JDBC and SQL/PL.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Explain JDBC architecture.

2. Describe how are files accessed using Java.

b. Mini Project:
Create the login page and validate the credentials using database

c. Other Activities (Specify):NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO.1: Able to use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.	15	12	1	1	29
CO.2: Understand and apply the concepts of Inheritance andInterfaces.	11	12	1	1	25
CO.3: Learn and applyapplet programming to create basic web pages.	11	12	1	1	25
CO.4: Understand the Java event handling model and apply to create interactive web pages.	13	12	1	1	27
CO.5: Able to implementI/O operations and connect to database to solve real worldproblems.	10	12	1	1	24
Total Hours	60	60	5	5	130

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	

CO.1	The Java Environment	02	05	01	08
CO.2	Inheritance and Interfaces	02	03	05	10
CO.3	Applet programming	02	03	07	12
CO.4	The Java Event Handling Model	1	3	7	10
CO.5	Input/Output and JDBC	1	05	05	10
Total		13	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Internet Applications using Java Programming will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	The Complete Reference Java 2	Naughton & Schildt	Tata McGraw Hill	
2	Core Java 2 (Vol I & II),	Horstmann & Cornell Tom M. Mitchell	Sun Microsystems	
3	Java 2.0	Ivan Bayross	BPB publications	
4	Beginning Java 2, JDK	Ivor Horton's	M.P. Granth Academy, Bhopal	5th edition
5	Java- How to Program	Deitel	Pearson Education, Asia	

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: Bachelor of Computer Applications (BCA)
Course Code : 02CA421
Course Title: Internet Applications using Java Programming

	Program Outcomes												Program Specific Outcome				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
Course Outcomes	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.

CO 1: Able to use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.	**2**	**2**	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**2**	**3**	**3**	**1**	**2**
CO 2: Understand and apply the concepts of Inheritance and Interfaces.	**1**	**3**	**2**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**3**	**2**	**2**	**2**	**1**	**3**
CO3: Learn and apply applet programming to create basic web pages.	**2**	**2**	**2**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**1**	**2**	**2**	**2**
CO 4: Understand the Java event handling model and apply to create interactive web pages.	**1**	**2**	**3**	**2**	**3**	**2**	**1**	**1**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**2**	**2**
CO 5: Able to implement I/O operations and connect to database to solve real world problems.	**1**	**2**	**2**	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**3**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Able to use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.	SO1.1, SO1.2, SO1.3, SO1.4, SO1.5, SO1.6, SO1.7, SO1.8, SO1.9, SO1.10, SO1.11, SO1.12, SO1.13, SO1.14, SO1.15		Unit-1 The Java Environment 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13,1.14,1.15	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Understand and apply the concepts of Inheritance and Interfaces.	SO2.1, SO2.2, SO2.3, SO2.4, SO2.5, SO2.6, SO2.7, SO2.8, SO2.9, SO2.10, SO2.11		Unit-2 Inheritance and Interfaces 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Learn and apply applet programming to create basic web pages.	SO3.1, SO3.2, SO3.3, SO3.4, SO3.5, SO3.6, SO3.7, SO3.8, SO3.9, SO3.10, SO3.11		Unit-3 Applet Programming 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Understand the Java event handling model and apply to create interactive web pages.	SO4.1, SO4.2, SO4.3, SO4.4, SO4.5, SO4.6, SO4.7, SO4.8, SO4.9, SO4.10, SO4.11, SO4.12, SO4.13		Unit-4 The Java Event Handling Model 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9, 4.10,4.11,4.12,4.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Able to implement I/O operations and connect to database to solve real world problems.	SO5.1, SO5.2, SO5.3, SO5.4, SO5.5, SO5.6, SO5.7, SO5.8, SO5.9, SO5.10		Unit-5 Input/Output and JDBC 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10	

AKS University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Course Code: 03CA431

Course Title: **E-Commerce**

Pre-requisite: Basic understanding of Business concepts and Online technologies.

Rationale: This syllabus aims to equip students with a robust foundation in e-commerce, integrating historical context, technological advancements, and critical security considerations for a comprehensive understanding of this dynamic field.

Course Outcomes:

03CA431.1: To learn the fundamentals of E — Commerce and its process.

03CA431.2: To understand the role of E- commerce in the present scenario along with the concepts of security and its applications.

03CA431.3: To gain knowledge of e-commerce business needs and resources and match to technology consideringhuman factors and budget constraints.

03CA431.4: To apply knowledge of changing technology on traditional business models and strategy.

03CA431.5: To have skills to Communicate effectively and ethically using electronic communication.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Open Elective	03CA431	**E-Commerce**	4	0	1	1	6	4

Legend: **CI**: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW &SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:Theory

Boar	Co		Scheme of Assessment (Marks)		
			Progressive Assessment (PRA)	End Semester Assess	Total Marks

d of Study	use Code	Course Title	Class/HomeAssignment5 number 3 marks each (CA)	Class Test 2 (2 best out Of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	**ment (ESA)**	(PRA+ESA)
OE	03CA431	E-Commerce	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

03CA431.1: To learn the fundamentals of E — Commerce and its process.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand the historical evolution and categorization of e-commerce. **SO1.2** Differentiate between the types of e-commerce and articulate their respective advantages and disadvantages. **SO1.3** Identify and analyze the key elements of e-	.	**Unit-1.0 Introduction to E-Commerce** 1.1 Introduction & Brief history of e-commerce 1.2 Types 1.3 Advantages & Disadvantages of e-commerce 1.4 Elements of e-commerce	1. Explore the evolution and current trends of e-commerce through online articles and case studies.

commerce in practical scenarios. **SO1.4** Evaluate the principles underlying effective e-commerce strategies. **SO1.**5 Assess the significance of common service infrastructure and other key support layers in the e-commerce ecosystem. .		1.5 Principles of e-commerce 1.6 Messaging and Information distribution 1.7 Messaging and information distribution 1.8 Common service infrastructure 1.9 other key support layers.	

SW-1Suggested Sessional Work (SW):

a. **Assignments**:

1. Analyze a specific e-commerce platform, outlining its history, business model, advantages, and potential areas for improvement.

b. Mini Project:

1. Develop a basic e-commerce website with essential functionalities, emphasizing user-friendly design and secure payment gateways.

c. Other Activities (Specify):

1. Participate in a virtual panel discussion or webinar on emerging technologies shaping the future of e-commerce.

03CA431.2: To understand the role of E- commerce in the present scenario along with the concepts ofsecurity and its applications.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO1.1 Define EDI and its origin, understanding the system approach and communication strategies. **SO1.2** Explain the migration process to open EDI, emphasizing its benefits. **SO1.3** Demonstrate the mechanics involved in EDI, showcasing practical application. **SO1.4** Evaluate the integration of E-commerce with WWW/Internet, discerning its impact. **SO1.5** Develop an understanding of E-Government concepts and apply them in various contexts, including G2C, G2B, and G2G applications.	.	**Unit-2.0 EDI** **Introduction** 1.1 EDI to e-commerce: 1.2 EDI - Origin System approach 1.3 Communication approach 1.4 Migration to open EDI-Approach Benefits 1.5 Mechanics 1.6 E.com with WWW/Internet 1.7 E-Government Concepts 1.8 Applications of G2C 1.9 G2B 1.10 G2G	1. Explore EDI's evolution, covering its origin, system approach, and communication strategies.

SW-2 Suggested Sessional Work (SW):

a. **Assignments**:
   1. Investigate the advantages and migration processes of open EDI, emphasizing its approach and benefits.

b. Mini Project:
   1. Develop an E-commerce platform integrated with the WWW/Internet, showcasing practical applications and mechanics.

c. Other Activities (Specify):
   1. Dive into E-Government concepts and highlight real-world scenarios with Applications of G2C, G2B, and G2G interactions

03CA431.3: To gain knowledge of e-commerce business needs and resources and match to technology considering human factors and budget constraints.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO3.1 Apply OSI and TCP/IP Models for Efficient Network Communication. **SO3.**2. Evaluate the Advantages and Disadvantages of LAN, WAN, MAN Internetworking. **SO3.**3. Analyze the Distinctions Between Internet and Online Services. **SO3.**4. Assess the Impact of Architecture Choices: Open vs. Closed, Controlled vs. Uncontrolled. **SO3.**5. Critically Examine Pricing Models: Metered Pricing vs. Flat Pricing, Balancing Innovation and Control.	.	**Unit-3: Basics of Electronic communication** 3.1. Electronic communication PC 3.2. Networking 3.3. Network topologies 3.4. Communication media 3.5. E-mail 3.6. OSI and TCP/IP Models 3.7. LAN, WAN, MAN Internetworking — Bridges and gateways 3.8. Internet Vs Online services 3.9. Open vs. Closed Architecture 3.10. Controlled contained 3.11. Uncontrolled contained 3.12. Metered Pricing Vs Flat pricing Innovation Vs Control.	1. Explore electronic communication, PC, and networking fundamentals, covering network topologies, communication media, and the OSI/TCP/IP models.

SW-3 Suggested Sessional Work (SW):

a. **Assignments**:
   1. Analyze the distinctions between LAN, WAN, MAN, and investigate the role of bridges and gateways in internetworking, comparing Internet and online services with a focus on open vs. closed architecture.

b. Mini Project:
   1. Develop a controlled content e-commerce platform, emphasizing metered pricing versus flat pricing strategies, integrating innovative features while ensuring user security.

c. Other Activities (Specify):
   1. Participate in discussions on the implications of controlled versus uncontrolled content in e-commerce, examining the balance between innovation and control for sustainable business growth.

03CA431.4: To apply knowledge of changing technology on traditional business models and strategy.

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	0
SW	2
SL	1
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO4.1 Demonstrate proficiency in utilizing web software development tools to create functional and user-friendly websites. **SO4.**2. Examine the key concepts behind the success of the web and its impact on e-commerce. **SO4.**3. Assess the overview of electronic payment systems, including digital cash, electronic checks, and online credit card-based systems. **SO4.**4. Develop an understanding of consumer legal and business issues in the context of electronic commerce. **SO4.**5. Comprehend the interplay of concepts and technologies shaping the web, particularly its role in e-commerce.		**Unit-4 : Basics of WWW & Electronic Payment System:** 4.1 WWW 4.2 Electronic Payment System 4.3 Applications 4.4 What is web 4.5 Why is the Web such a hit 4.6 The Web and E.Com 4.7 Concepts & Technology — Key concepts 4.8 Web Software development Tools 4.9 Electronic payment system — Overview 4.10 Electronic or digital cash 4.11 Electronic Checks 4.12 Online credit card-based system 4.13 Other Engineering financial instruments 4.14 Consumer legal and Business issues.	1. Explore key concepts of the World Wide Web and electronic payment systems independently .

SW-4 Suggested Sessional Work (SW):

a. **Assignments**:
   1. Apply learned concepts by completing assignments on web applications, development tools, and e-payment systems.

b. **Mini Project**:
   1. Develop a mini project integrating web concepts and electronic payment systems, addressing consumer legal and business issues.

c. Other Activities (Specify):
   1. Engage in discussions, case studies, and practical exercises to enhance understanding of web technologies and their implications in e-commerce.

03CA431.5: To have skills to Communicate effectively and ethically using electronic communication.

Item	Appx. Hrs.
Cl	15
LI	0
SW	2
SL	1
Total	18

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1. Demonstrate the application of computer security measures to safeguard digital assets. **SO5.**2. Evaluate specific intruder approaches for potential vulnerabilities and countermeasures. **SO5.**3. Develop effective security strategies for diverse digital environments. **SO5.**4. Assess the use of cryptography, including public and private key encryption, for data protection. **SO5.**5. Execute advertising strategies on the internet, incorporating marketing principles and website creation, considering electronic publishing architecture and tools.		**Unit5: Security and Application:** 5.1 Basics of Security and Application 5.2 Need of computer security 5.3 Specific intruder approaches 5.4 Security strategies 5.5 Cryptography 5.6 Public key encryption 5.7 Private key encryption 5.8 Digital signatures 5.9 Advertising on the internet: Marketing 5.10 Creating a website. 5.11 Electronic publishing issues 5.12 EP architecture 5.13 EP tools 5.14 Web page EP-Baseline issues 5.15 Application tools and publishing on the internet	1. Explore specific intruder approaches for computer security. 2. Investigate cryptography fundamentals, including public and private key encryption and digital signatures.

SW-5Suggested Sessional Work (SW):

a. Assignments:

1. Develop an internet marketing strategy and create a website.

b. Mini Project:

1. Implement an Electronic Publishing (EP) architecture, utilizing EP tools for web page development and addressing baseline issues.

c. Other Activities (Specify):

1. Engage in application tools and hands-on internet publishing, ensuring practical exposure beyond traditional coursework.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)

03CA431.1: To learn the fundamentals of E — Commerce and its process.	9	2	1	12
03CA431.2: To understand the role of E-commerce in the present scenario along with the concepts of security and its applications.	10	2	1	13
03CA431.3: To gain knowledge of e-commerce business needs and resources and match to technology considering human factors and budget constraints.	12	2	1	15
03CA431.4: To apply knowledge of changing technology on traditional business models andstrategy.	14	2	1	17
03CA431.5: To have skills to Communicateeffectively and ethically using electronic communication.	15	2	1	18
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Introduction to E-Commerce	03	01	01	05
CO-2	EDI Introduction	02	02	01	05
CO-3	Basics of Electronic communication	03	07	05	15
CO-4	Basics of WWW & Electronic Payment System	04	06	05	15
CO-5	Security and Application	03	04	03	10
Total		11	15	20	15

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for E-Commerce will be held with written examination of 50 marks.

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/ Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/ Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

a)Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Electronic Commerce	Ravi Kalakota and Andrew B. Whinston	Addison-Wesley	1st , 1996
2	Web Commerce Technologies Handbook:	Daniel Minoli & Emma Minoli	McGraw-Hill	1st , 2017
3	E-Commerce	Dr. Varinder Bhatia	Excel Books	2013
4	Promise of E-Governance	MP Gupta		
7	Lecture note provided by Dept. Of CSE, AKS University, Satna.			

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: Bachelor of Computer Applications (BCA)
Course Code: 03CA431
Course Title: E-Commerce

	Program Outcomes												Program Specific Outcome				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
Course Outcomes	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.

CO1: To learn the fundamentals of E — Commerce and its process.	**2**	**2**	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**2**	**3**	**3**	**1**	**2**
CO2: To understand the role of E- commerce in the present scenario alongwith the concepts of security and its applications.	**1**	**3**	**2**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**3**	**2**	**2**	**2**	**1**	**3**
CO3: To gain knowledge of e-commerce business needs and resources and match to technology considering human factors and budget constraints.	**2**	**2**	**2**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**1**	**2**	**2**	**2**
CO4: To apply knowledge of changing technology on traditional business models and strategy.	**1**	**2**	**3**	**2**	**3**	**2**	**1**	**1**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**2**	**2**
CO5: To have skills to Communicate effectively and ethically using electronic communication .	**1**	**2**	**2**	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**3**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO1:** To learn the fundamentals of E-Commerce and its process.	SO1.1, SO1.2, SO1.3, SO1.4, SO1.5, SO1.6, SO1.7, SO1.8, SO1.9, SO1.10, SO1.11, SO1.12, SO1.13, SO1.14, SO1.15		Unit-1 The Java Environment 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13,1.14,1.15	As mentioned in page number above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO2:** To understand the role of E- commerce in the present scenario along with the concepts of security and its applications.	SO2.1, SO2.2, SO2.3, SO2.4, SO2.5, SO2.6, SO2.7, SO2.8, SO2.9, SO2.10, SO2.11		Unit-2 Inheritance and Interfaces 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3:** To gain knowledge of e- commerce business needs and resources and match to technology considering human factors and budget constraints.	SO3.1, SO3.2, SO3.3, SO3.4, SO3.5, SO3.6, SO3.7, SO3.8, SO3.9, SO3.10, SO3.11		Unit-3 Applet Programming 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO4:** To apply knowledge of changing technology on traditional business models and strategy.	SO4.1, SO4.2, SO4.3, SO4.4, SO4.5, SO4.6, SO4.7, SO4.8, SO4.9, SO4.10, SO4.11, SO4.12, SO4.13		Unit-4 The Java Event Handling Model 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9, 4.10,4.11,4.12,4.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5**: To have skills to Communicate effectively and ethically using electronic communication.	SO5.1, SO5.2, SO5.3, SO5.4, SO5.5, SO5.6, SO5.7, SO5.8, SO5.9, SO5.10		Unit-5 Input/Output and JDBC 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10	

AKS University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-IV

Course Code: **03CA432**

Course Title: **Computer Maintenance and Troubleshooting**

Pre-requisite: Basic understanding of Business concepts and Online technologies.

Rationale: This syllabus aims to equip students with a robust foundation in computer maintenance

Course Outcomes:

03CA432.1: To learn the fundamentals CPU organization and architecture

03CA432.2: To understand the laptop maintenance

03CA432.3: To gain knowledge Peripheral maintenance.

03CA432.4: To apply knowledge Monitor and Network devices

03CA432.5: To have skills to Tools and Techniques

.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Open Elective	**03CA432**	**Computer Maintenance and Troubleshooting**	4	0	1	1	6	4

Legend: **CI**: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW &SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Boa	Couse	Course Title	Scheme of Assessment (Marks)		
			Progressive Assessment (PRA)	End Semester Assess	Total Marks

rd of Study	Code		Class/HomeAssignment5 number 3 marks each (CA)	Class Test 2 (2 best out Of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	**ment (ESA)**	(PRA+ESA)
Oe	**03CA432**	Computer Maintenance	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

03CA432.**1:** To learn the fundamentals of Computer Maintenance.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO1.1 Understand the CPU **SO1.2** Differentiate between the types of Processors **SO1.3** Identify interrupts. **SO1.4** Understanding various system ports **SO1.**5 Assess the significance of Various system calls during .	.	**Unit-1. CPU organization and architecture:** 1. **Definition (CPU, Interface, Peripherals), CPU** 2. **generations comparison,** 3. **PIN out diagram of CPU** 4. **8085 vs Pentium processor,** 5. **Multicore architecture,** 6. **Input/output interface (Interrupts and DMA mode),** 7. **Interrupts (Hardware, Software),** 8. **Understanding various system ports** 9. **and their significance,** 10. **Port settings,** 11. **Various system calls during booting process,** 12. **Peripheral vs interfaces**	1. Explore the evolution CPU

SW-1Suggested Sessional Work (SW):

a. **Assignments**:

13. Analyze Multicore architecture,

.

b. Other Activities (Specify):

1. Participate in a virtual panel discussion or webinar on emerging technologies shaping the future of e-commerce.

03CA432.2: To understand the Laptop maintenance

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Define Voltage, Current, Watt, Ohms, AC, DC; **SO2.2** Explain the Working of Digital Multi meter, Resistor, Capacitor, Diode 1. SO2.3 Demonstrate the Fault finding and repairing. **SO2.4** Evaluate Working and settings of touchpad, Audio & video section **SO2.5** Develop an understanding Installation of OS and driver in a laptop	.	**Unit-2. Laptop maintenance:** 2. **Introduction to Voltage, Current, Watt, Ohms, AC, DC;** 3. **Working of Digital Multi meter, Resistor, Capacitor, Diode,** 4. **Transistor, Coil, MOSFET, IC, Transformer, Crystal, Fuse,** 5. **Thermistor, Soldering & de soldering.** 6. **Laptop motherboard sections,** 7. **assembling and disassembling,** 8. **Fault finding and repairing.** 9. **Working of battery section, Power settings,** 10. **Various ports on laptop,** 11. **Working and settings of touchpad, Audio & video section.** 12. **Installation of OS and driver in a laptop,** 13. **Installation of application software**	1. Explore **assembling and disassembling**

SW-2 Suggested Sessional Work (SW):

a. **Assignments**:

14. Investigate the **Various ports on laptop,**
    1. **Laptop motherboard sections**

Other Activities (Specify):

03CA432.**3:** To gain knowledge Peripheral maintenance.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand Keyboard, Mouse problems and solution **SO3.**2. Evaluate the Different sections of printer **SO3.**3. Analyze the Resolution function keys and operating menu, working of different sections of all in one printer**,** **SO3.**4. Assess the Impact of Cartridge Maintenance **SO3.**5. Critically Examine Working of power supply, Block diagram of all in one printer	.	**Unit-3: Peripheral maintenance:** 3.1. **Keyboard, Mouse problems and solution,** 3.2. **Repairs and replacement. Printer maintenance:** 3.3. **Different sections of printer, Interface section,** 3.4. **Repairing of printer, Testing of printer, Function, block diagram of laser printer and process, Image formation (Cleaning to fusing Process),** 3.5. **Electronic section of laser printer (Formatter PCA and DC Controller),** 3.6. **Mechanical section of laser printer (Paper feeding, Motor solenoid, Drum, roller).** 3.7. **Introduction of all in one printer, Printing technology,** 3.8. **Cartridge Maintenance, Scanner technology,** 3.9. **Resolution function keys and operating menu, working of different sections of all in one printer,** 3.10. **Printer sensor repairs and replacement,** 3.11. **Working of power supply, Block diagram of all in one printer,** 3.12. **Working of all sections**.	1. Explore Working of power supply, Block diagram of all in one printer

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Analyze the **Electronic section of laser printer (Formatter PCA and DC Controller),**

b. **Other Activities (Specify):**

1. Participate in discussions

03CA432.4: To apply knowledge Monitor and Network devices

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Demonstrate Monitor SO4.2. Examine the key concepts behind the Monitor SO4.3. Assess the Network peripherals: SO4.4. Develop an understanding of Cabling SO4.5. Comprehend Fix disk drives.		**Unit-4 Monitor:** **1. Classification,** **2. general problems and** **3. Repairing of monitors.** **4. Different sections in computer monitors.** **5. Network peripherals: Switches, Router,** **6. Modem, Bridge,** **7. Gateway (Installation, Configuration, Repairs),** **8. Cabling strategies and implementation,** **9. Network printer configuration.** **10. Fix disk drives:** **11. Types of fix disks,** **12. Problems and solutions, Formatting/ partitioning techniques (DOS,**	1. Explore key concepts of Network peripherals.

		Linux), Disk repairing tools, Disk doctor tool.	

SW-4 Suggested Sessional Work (SW):

a. **Assignments:**
   1. **Apply learned concepts by completing assignments on Network peripherals**
b. **Mini Project:**
   1. **Develop a mini project integrating Network peripherals.**
c. **Other Activities (Specify):**
   1. **Engage in discussions, case studies, and practical exercises to enhance understanding of Network peripherals**.

CO5: To have skills to Tools and Techniques

Item	Appx. Hrs.
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1. Demonstrate the Port HDMI splitter, USB extender **SO5.**2. Evaluate the Interfacing projector with PC and laptop. **SO5.**3. Develop effective security strategies for diverse digital environments. **SO5.**4. Assess the use of PCI to USB connectors **SO5.**5. apply WiFi finder, RFID		**Unit5: Tools and Techniques:** **1. Port HDMI splitter, USB extender,** **2. External disk drives,** **3. Interfacing projector with PC and laptop,** **4. Interfacing video and audio devices,** **5. Drawing tablet (Introduction, Problems and solutions)** **6. PCI to USB connectors** **7. Intelligent devices and uses,** **8. WiFi finder, RFID security mobile disk,** **9. 3D Printer (Introduction, Working,**	1. Explore Drawing tablet

		10. Different sections), Infrared and 11. bluetooth devices, 12. Scanner, Joystick.	

SW-5Suggested Sessional Work (SW):

a. Assignments:

1. Develop an RFID security.

b. Other Activities (Specify):

1. Engage in application tools and hands-on

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
03CA432.1: To learn the fundamentals CPU organization and architecture	12	2	1	15
03CA432.2: To understand the Laptop maintenance	12	2	1	15
03CA432.**3:** To gain knowledge Peripheral maintenance	12	2	1	15
03CA432.**4:** To apply knowledge Monitor and Network devices	12	2	1	15
03CA432.**5**: : To have skills to Tools and Techniques	12	2	1	15
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	**Unit Titles**	**Marks Distribution**			**Total Marks**
		R	**U**	**A**	
CO-1	**CPU organization and architecture**	03	01	01	05

CO-2	**Laptop maintenance**	02	02	01	05
CO-3	**Peripheral maintenance**	03	07	05	15
CO-4	**Monitor**	04	06	05	15
CO-5	**Tools and Techniques**	03	04	03	10
Total		11	15	20	15

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment will be held with written examination of 50 marks.

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/ Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/ Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

a)Books: Text Books:

S. No.	Title	Author	Publisher	Edition & Year
1	IBMPC and clones",	B. Govinda rajalu, "	McGraw-Hill, India,	September 2002, 2nd Edition.
2	The laptop repair workbook	Morris Rosenthal	Foner books, India,	1st June 2008, 1st Edition.
3	Computer System Architecture	M. Morris Mano,	Pearson Education India	January 2007, 3rd Edition.

Curriculum Development Team

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2. Dr. Pramod Singh, Associate Professor, Department of Computer Science and Engineering.
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COs, POs and PSOs Mapping

Program: Bachelor of Computer Applications (BCA)

Course Code: 03CA432

Course Title: Computer Maintenance and Troubleshooting

	Program Outcomes												Program Specific Outcome				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
Course Outcomes	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.

CO1: To learn the fundamentals CPU organization and architecture	**2**	**2**	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**2**	**3**	**3**	**1**	**2**
CO2: To understand the laptop maintenance	**1**	**3**	**2**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**3**	**2**	**2**	**2**	**1**	**3**
CO3: To gain knowledge Peripheral maintenance	**2**	**2**	**2**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**1**	**2**	**2**	**2**
CO4: To apply knowledge Monitor and Network devices	**1**	**2**	**3**	**2**	**3**	**2**	**1**	**1**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**2**	**2**
CO5: To have skills to Tools and Techniques	**1**	**2**	**2**	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**3**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: To learn the fundamentals CPU organization and architecture	SO1.1, SO1.2, SO1.3, SO1.4, SO1.5, SO1.6, SO1.7, SO1.8, SO1.9, SO1.10, SO1.11, SO1.12, SO1.13, SO1.14, SO1.15		Unit-1 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: To understand the laptop maintenance	SO2.1, SO2.2, SO2.3, SO2.4, SO2.5, SO2.6, SO2.7, SO2.8, SO2.9, SO2.10, SO2.11		Unit-2 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: To gain knowledge Peripheral maintenance	SO3.1, SO3.2, SO3.3, SO3.4, SO3.5, SO3.6, SO3.7, SO3.8, SO3.9, SO3.10, SO3.11		Unit-3 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: To apply knowledge Monitor and Network devices	SO4.1, SO4.2, SO4.3, SO4.4, SO4.5, SO4.6, SO4.7, SO4.8, SO4.9, SO4.10, SO4.11, SO4.12, SO4.13		Unit-4 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO5**: : To have skills to Tools and Techniques	SO5.1, SO5.2, SO5.3, SO5.4, SO5.5, SO5.6, SO5.7, SO5.8, SO5.9, SO5.10		Unit-5 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application& Information Technology

BCA (Bachelor of Computer Applications)

Semester-V

Course Code: 0CA504

Course Title: Cyber Security

Pre-requisite: In order to learn Cyber Security, students must be familiar with the basics of computer science. To understand how to protect information systems from attack, it is necessary to understand how systems work.

Rationale: The objective of this course is to introduce Cyber Security Application of Cyber Security, pattern matching and cluster analysis is included to aware students of broad Cyber Security areas.

Course Outcome:

Upon completion of the degree program, students will be:-

0CA504.1: Understand the cyber security threat landscape.
0CA504.2: Develop a deeper understanding and familiarity with various types of cyberattacks, cybercrimes,vulnerabilities and remedies thereto.
0CA504.3: Analyze and evaluate existing legal framework and laws on cyber security.
0CA504.4: Analyze and evaluate the digital payment system security and remedial measures against digitalpayment frauds.
0CA504.5: Students will adeptly comprehend, apply, and utilize digital device security principles, tools, andtechnologies to mitigate cyber threats effectively.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme ofstudies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
Skill Enhancement	0CA504	Cyber Security	4	0	1	1	6	4

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance sin laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW&SL has to be planned and perform denuder the continuous guidance and feedback of teacher to

ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Course Code	Course Title	SchemeofAssessment (Marks)							
			ProgressiveAssessment(PRA)						EndSemester Assessment	Total Marks
			Class/HomeAssignment5number 3 marks each (CA)	Class Test2(2bestoutof3)10 markseach (CT)	Seminar one (SA)	ClassActivityanyone (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ESA)
SE	0CA504	Cyber Security	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

0CA504.1: Understand the cyber security threat landscape.

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO1.1 Defining Cyberspace and Overview of Computer and Web-technology **SO1.2** Architecture of cyberspace. **SO1.3** Communication and web technology, Internet, World wide web, **SO1.4** Advent of internet, Internet infrastructure for data transfer and governance **SO1.**5 Issues and challenges of cyber security		**Module-1.0 Introduction to Cyber security**: 1.1. Defining Cyberspace and 1.2 Overview of Computer and 1.3 Web-technology 1.4 Architecture of cyberspace. 1.5 Communication and web technology, 1.6 Internet, World wide web, 1.7 Advent of internet, 1.8 Internet infrastructure for data transfer and governance 1.9 Internet society, 1.10 Regulation of cyberspace, 1.11 Concept of cyber security, 1.12 Issues and challenges of cyber security	1. Learn about Cyber Security.

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   - Issues and challenges of cyber security
   - Concept of cyber security

b. **Mini Project:**
   - Explore common cyber threats such as malware, phishing, ransomware, and DDoS attacks.

c. **Other Activities (Specify):**
   - Provide examples and case studies.

0CA504.2: Develop a deeper understanding and familiarity with various types of cyberattacks,cybercrimes, vulnerabilities and remedies thereto.

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand Classification of cybercrimes, **SO2.2** LearnAbout Common cybercrimes- cybercrime targeting computers and mobiles **SO2.3** Understand about social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, **SO2.4** Cybercriminals modus-operandi , Reporting of cybercrimes, Remedial and mitigation measures, **SO2.**5 Legal perspective of cybercrime, IT Act 2000 and its amendments,		**Module 2.0 Cyber-crime and Cyber law** 2.1 Classification of cyber-crimes, 2.2 Common cyber-crimes 2.3 cyber-crime targeting computers and mobiles 2.4 cybercrime against women and children, 2.5 financial frauds, 2.6 social engineering attacks, 2.7 malware and ransomware attacks,	SL1. Students, at the end of this module, should be able to understand the cyber-crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures.

		2.8 zero day and zero click attacks, 2.9 Cybercriminals modus-operandi , Reporting of cyber-crimes, Remedial and mitigation measures, 2.10 Legal perspective ofcyber-crime, IT Act 2000 and its amendments, 2.11 Cyber-crime and offences, organizations dealing with Cybercrime and 2.12 Cyber security in India	

SW-2 Suggested Sessional Work (SW):

a) Assignments:
- Define social engineering attacks, malware and ransomware attacks, zero day and zero click attacks.

b) Mini Project:
- Explore common cyber threats such as malware, phishing, ransomware, and DDoS attacks.

c) Other Activities (Specify):
- Provide examples and case studies.

0CA504.3: Analyze and evaluate existing legal framework and laws on cyber security.

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO3.1 Understand about Introduction to Social networks. **SO3.2** Understand Types of Social media, Social media platforms, **SO3.3**Use of Social media monitoring, Hashtag, Viral content, **SO3.4** Understand about Social media privacy, Challenges, opportunities and pitfalls in online social network **SO3.5** understand about Best practices for the use of Social media		**Module-3.0 Social Media Overview and Security** **3.1** Introduction to Social networks. **3.2** Types of Social media, Social media platforms, **3.3** Social media monitoring, **3.4** Hashtag, Viral content, **3.3** Social media marketing, **3.4** Social media privacy, **3.5** Challenges, opportunitiess and **3.6** pitfalls in online social network **3.7** Security issues related to social media, **3.8** Flagging and reporting of inappropriate content, **3.9** Laws regarding posting of inappropriate content, **3.10** Best practices for the use of Social media **3.11** privacy andsecurity concerns ononline Socialmedia andunderstand the reporting procedure of inappropriate e content, **3.12** 2 underlying legal aspectsand bestpractices forthe use ofSocial mediaplatforms	SL1. On completion of this module, students should be able to appreciate various

SW-3 Suggested Sessional Work (SW):

a) Assignments:

- Define social engineering attacks, malware and ransomware attacks, zero day and zero click attacks.

b) Mini Project:

- Explore common cyber threats such as malware, phishing, ransomware, and DDoS attacks.

c) Other Activities (Specify):

- Provide examples and case studies.

A K S University

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0CA504.4: **Analyze and evaluate the digital payment system security and remedial measures against digital payment frauds.**

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
4.1 Understand about R Definition of E-Commerce, Main components of E-Commerce **SO4.2** Understand about E-Commerce security best practices, **SO4.3** Understand to digital payments, Components of digitalpayment and stake holders, **SO4.4** Understand about Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e- Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, **SO4.5** understands about digital payments and customer protection in unauthorized banking transactions.		**Module 4.0 E – Commerce and DigitalPayments** 4.1 Definition of E-Commerce, 4.2 Main Components of E-Commerce. 4.3 Elements of E- Commerce security, 4.4 E-Commerce threats, 4.5 E-Commerce security best practices, 4.6 Introduction to digital payments, Components of digital payment and stake holders, 4.7 Modes of digital payments- Banking Cards, 4.8 Unified Payment Interface (UPI), e-Wallets, 4.9 Unstructured Supplementary Service Data (USSD),Aadhar enabled payments, 4.10 Digital payments related common frauds and preventive measures. 4.11 RBI guidelines on digital	1. Understand the basic concepts related to E-Commerce and digital payments. Theywill become familiar with various digital payment modesand related cyber security aspects, RBI guidelines and preventive measures against digital payment frauds.

		payments and customer protection in unauthorized banking transactions. 4.12 Relevant provisions of Payment Settlement Act,2007,	

SW4 Suggested Sessional Work (SW):

a) Assignments:
- Understand about Flagging and reporting of inappropriate content

b) Mini Project:
- Explore popular cybersecurity tools (e.g., Wireshark, Nmap, Metasploit).

c) Other Activities (Specify):
- Case Study: Provide hands-on examples of tool usage.

0CA504.5: Students will adeptly comprehend, apply, and utilize digital device security principles, tools, and technologies to mitigate cyber threats effectively.

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes(SOs)	**Laboratoryy Instructions (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand about End Point device and Mobile phone security, Password policy, **SO5.2** Security patch management, Data backup, Downloading and management of third party software, Device security policy, **SO5.3**understand about Cyber Security best practices, **SO5.4**understand to Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, **SO5.5** understand about Cyber Security best practices, Significance of host		**Module 5.0 Digital Devices Security,** **Tools and Technologies for** 5.1 End Point device and Mobile phone security, Password policy, 5.2 Security patch management, Data backup, 5.3 Downloading and management of third party software, 5.4 Device security policy, 5.5 Cyber Security best	1 Students, after completion of this modulewill be able to understand the basic security aspects related to Computer and Mobiles. They will be able touse basic toolsand technologiesto protect their devices.

firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security.		practices, Significance of host firewall and Ant-virus, 5.6 Management of host firewall and Anti-virus, 5.7 Wi-Fi security, Configuration of basic securitypolicy and permissions End Point device and Mobile phonesecurity, 5.8 Password policy, Security patch management, Data backup, 5.9 Downloading and management of third party software, Device security policy, 5.10 Cyber Security best practices, Significance of host firewall and Ant-virus, 5.11 Management of host firewall and Anti-virus, Wi-Fi security, 5.12Configuration of basic security Policy and permissions.	

SW-5 Suggested Sessional Work (SW):

a) Assignments:
- Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments,

b) Mini Project:
- Analyze real-world cybersecurity incidents.

c) Other Activities (Specify):
- Case Study: Explore regulations and compliance requirements.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour(Cl+SW +Sl)
0CA504.1: Understand the cyber security threat landscape.	12	1	1	14
0CA504.2: Develop a deeper understanding and familiarity with various types of cyberattacks, cybercrimes, vulnerabilities and remedies thereto.	12	1	1	14
0CA504.3: Analyze and evaluate existing legal framework andlaws on cyber security.	12	1	1	14

0CA504.4: Analyze and evaluate the digital payment systemsecurity and remedial measures against digital paymentfrauds.	12	1	1	14
0CA504.5: Students will adeptly comprehend, apply, and utilizedigital device security principles, tools, and technologies to mitigate cyber threats effectively.	12	1	1	14
Total Hours	60	5	5	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
0CA504.1	Unit-1	03	04	03	10
0CA504.2	Unit-2	05	03	02	10
0CA504.3	Unit-3	05	03	02	10
0CA504.4	Unit-4	04	05	01	10
5BCA.5	Unit-5	03	05	02	10
Total		20	17	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment will be held with written examination of 50 marks

Note.DetailedAssessmentrubricneedtobepreparedbythecoursewiseteachersforabovetasks.Teacherscanalso design different tasks asper requirement for end Semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role-play
6. Visit to IT Industry.
7. Demonstration
8. ICTBasedTeachingLearning(VideoDemonstration/TutorialsCBT,Blog,Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition &Year
1	Cyber Crime Impact in the New Millennium,	R. C Mishra	Author Press. Edition	2010
2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Sumit Belapure and Nina Godbole,	Wiley India Pvt. Ltd.	2011
3	Security in the Digital Age: Social Media Security Threats and Vulnerabilities	Henry A. Oliver	Create Space Independent Publishing Platform	2011
4	Cyber Laws: Intellectual Property & E-Commerce Security	Kumar K, Dominant Publishers		
5	Network Security Bible	Eric Cole, Ronald Krutz, James W. Conley	2nd Edition, Wiley India Pvt. Ltd	

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COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 0CA504
Course Title: Cyber Security

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PS0 5
	Engineering knowledge	Problem analysis	Understand the cyber security threat landscape Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1Understand the cyber security threat landscape.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2Develop a deeper understanding and familiarity with various types of cyberattacks, cybercrimes, vulnerabilities and remedies thereto.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

CO3Analyze and evaluate existing legal framework and laws on cyber security.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO4: Analyze and evaluate the digital payment system security and remedial measures against digital payment frauds.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO.5: Students will adeptly comprehend, apply, and utilize digital device security principles, tools, and technologies to mitigate cyber threats effectively.	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs&PSOsNo.	COsNo.&Titles	SOsNo.	LaboratoryInstruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO1,2,3,4,5,6,7, 8,9,10,11,12 PSO1,2,3,4,5,6,7	CO1:Understand the cyber security threat Landscape.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		UNIT – I: Introduction to Cyber security: 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in Page number _to_
PO1,2,3,4,5,6,7, 8,9,10,11,12 PSO1,2,3,4,5	CO2:Develop a deeper understanding and familiarity with various types of cyberattacks, Cybercrimes, vulnerabilities and remedies thereto.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		UNIT – II: **Cyber-crime and Cyber law** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO1,2,3,4,5,6,7, 8,9,10,11,12 PSO1,2,3,4,5	CO3: Analyze and evaluate existing legalframework and laws on cyber security.	SO3.1SO3.2 SO3.3 SO3.4 SO3.5 SO3.6		UNIT – III: E – Commerce and Digital Payments 3.1,3.2,3.3,3.4,3.5,3.6	
PO1,2,3,4,5,6,7, 8,9,10,11,12 PSO1,2,3,4,5	CO4: Analyze and evaluate the digital payment system security and remedial measures against Digital payment frauds.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4: Digital Devices Security 4.1,4.2,4.3,4.4,4.5,4.6	
PO1,2,3,4,5,6,7, 8,9,10,11,12 PSO1,2,3,4,5	CO.5: Students will adeptly comprehend, apply, and utilize digital device security principles, tools, and technologies to mitigate cyber threats Effectively.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5: Tools and Technologies 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.C.A (Computer Science& Application) Program

Semester-V

Course Code: 01CA511

Course Title: Python programming

Pre-requisite: To study this Course, a student must have basic knowledge of computers

Rationale: Python has become a staple in data science, allowing data analysts and other Professionals to use the language to conduct complex statistical calculations, create Data visualizations, build machine learning algorithms, manipulate and analyses data, andcomplete other data-related tasks

Course Outcomes: After completing this course student will be**:**

01CA511.1: Develop and execute simple Python programs
01CA511.2: Structure a Python program into functions
01CA511.3: Using Python lists, tuples to represent compound data
01CA511.4: Develop Python Programs for file processing
01CA511.5: Implement error handling

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme ofstudies (Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
Major	01CA511	Python Programming	4	4	1	1	10	6

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performance sin laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW&SL has to be planned and perform denuder the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment(PRA)						EndSemesterAssessment	Total Marks
			Class/HomeAssignment5number 3 marks each (CA)	Class Test2(2bestoutof3)10 markseach (CT)	Seminar one (SA)	ClassActivityone (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	(ESA)	(PRA+ESA)
Major	01CA511	Python Programming	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Major	01CA511	Python Programming-Lab	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should show case their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) up on the course's conclusion.

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.C.A (Computer Science& Application) Program

01CA511.1: Develop and execute simple Python programs

Approximate Hours

Item	AppX Hrs
Cl	15
LI	12
SW	1
SL	1
Total	29

Session Outcomes (SOs)	LaboratoryInstruction(LI)	Classroom Instruction (CI)	Self- Learning(SL)
SO1.1 Understand the PYTHON **SO1.2 Explain** Object oriented, Embeddable **SO1.3 Discuss** Unix, Linux and Mac **SO1.4** Definition Jupyter Note Book, PyCharm **SO1.**5 Explain ATOM	1. Write a programto demonstrate different data types in Python. 2. Write a programto perform different Arithmetic Operations on numbers in Python. 3. Example of comments in python 4. Example of Input operation in python 5. Example of Output operation in python 6. Example of variables.	**Unit-1 What is Python**:- 1.1 WHY PYTHON? History 1.2 Dynamic, Interpreted 1.3 Object oriented, Embeddable 1.4 Extensible, Large standard libraries 1.5 Free and Open source 1.6 Download &Python Installation Process inWindows 1.7 Unix, Linux andMac 1.8 Online Python IDLE 1.9 Python Real time IDES like Spyder 1.10 Jupyter Note Book, PyCharm 1.11 Rodeo,Visual Studio code 1.12 ATOM 1.13 PyDevetc, Data Types and Variables 1.14 Numbers, Operators Commentsin Python 1.15 Input output operation in Python.	1 Rodeo, Visual Studio code 2 Numbers, Operators Comments in Python

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Extensible, Large standard libraries

ii. Python Real time IDES like Spyder

iii. Input output operation in python.

b. Major - Paper I:

c. Other Activities (Specify): Seminar

01CA511.2: Structure a Python program into functions

Approximate Hours

Item	Appx Hrs
Cl	11
LI	12
SW	1
SL	1
Total	25

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand the Control Statements **SO2.2** To learn if, If else, If-elif-else **SO2.3** To lean about Function in python **SO2.4 Explain the** types of function in python **SO2.**5 define map, reduce, filter function	1 Write a program to create, concatenate and print a string and accessing sub-string from a given string. 2 Write a python script to print the current date in the following format a. "Fri Oct 1102:26:23 IST2019". 3 Example of else if 4 Example of List and tuple 5 Example of Dictionary 6 Example of for and while.	**Unit-2 Control Statements:** **2.1** Conditional control statements **2.2** if, If else, If-elif-else **2.3** control statements- **2.4** for, while **2.5** Data Structure & Collection **2.6** String, List, Tuple, Set, Dictionary **2.7** Comparison of List, Tuple and Set **2.8** Function in python **2.9** types of function in python **2.10** map, reduce, filter function **2.11** Lambda Function	1. Conditional control statements 2. String,List,Tuple,Set, Dictionary

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. control statements-for, while

ii. String, List, Tuple, Set, Dictionary

iii. Data Structure & Collection

A Major - Paper I:

b. Other Activities (Specify):

01CA511.3: Using Python lists, tuples to represent compound data

Approximate Hours

Item	Appx Hrs
Cl	10
LI	12
SW	1
SL	1
Total	24

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3.1 To Understand the Importance of modular programming **SO3.2** To learn What is module? Types of Modules**SO3.3** To understand the User defines module creation **SO3.4** To design Package v/sFolder **SO3.5 define the** File and Directory handling in Python	1. Write a program to create, append, and remove lists in python. 2 Write a program to demonstrate working with tuples in python. Example of modules. 3. Example of modules 4. Example of date functions. 5. Example of time functions 6. Example of userdefined functions.	**Unit-3: Importance of modular:** **3.1** Importance of modular programming **3.2** What is module? Types ofModules **3.3** Pre-defined, User defined. **3.4** User defines module creation **3.5** OS, Date-time, math modules **3.6** organizing python project intopackages **3.7** Types of packages **3.8** - pre defined, user defined. **3.9** Package v/s Folder, **3.10** File and Directory handlingin Python	1. What is module? Types of Modules 2. organizing python project into packages

SW-3SuggestedSessionalWork (SW):

a. Assignments:

What is module? Types of Modules

1. organizing python project into packages
2. File and Directory handling in Python

b. Major - Paper I:

c. Other Activities (Specify):

01CA511.4: Develop Python Programs for file processing

Approximate Hours

Item	Appx Hrs
Cl	11
LI	12
SW	1
SL	1
Total	25

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Evaluation of Procedural v/s Object oriented programming **SO4.2** Understanding the Abstraction, Polymorphism **SO4.3 Explain** Exception handling types of errors **SO4.4** To lean about raise, and Need to Custom exceptions **SO4.5 define the** regular expression	1. Write a program to demonstrate working with dictionaries in python. 2. Write a python program to find largest of three numbers. 3. Example of abstraction 4. Example of Polymorphism 5. Example of Inheritance 6. Example of try and catch	**Unit-4 : Procedural v/s Object:-** **4.1** Procedural v/s Object oriented programming **4.2** Principles of OOP – Encapsulation **4.3** Abstraction, **4.4** Polymorphism **4.5** Inheritance. Inner Classes **4.6** Exception handling **4.7** types of errors **4.8** try, except, finally **4.9** raise, and Need to Custom exceptions **4.10** Case studies, **4.11** regular expression	**1.** Principles of OOP – Encapsulation **2.** Polymorphism Inheritance.

SW-4Suggested Sessional Work (SW):

a. Assignments:

1. Inheritance. Inner Classes
2. raise, and Need to Custom exceptions
3. Abstraction, Polymorphism

b. Major - Paper I:

c. Other **Activities (Specify):**

01CA511.5: Implement error handling

Approximate Hours

Item	AppX Hrs
Cl	13
LI	12
SW	1
SL	1
Total	30

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 understand the Multithreading and multiprocessing in python **SO5.2 Explain** Threading module, Creating thread **SO5.3** To understand the Single threaded application **SO5.4** To understand We call run () directly? Need to start(), method **SO5.**5 Explain Base Communications (PDBC),	1. Write a python program to define a module to find Fibonacci Numbers and import the module to another program. 2. Write a python program to define a module and import a specific function in that module to another program. 3. Example of multithreading in python. 4. Example of synchronization. 5. Use of NumPy panda. 6. MatPlot Lib	**Unit5: Multithreading and multiprocessing:** 5.1 Multithreading and multiprocessing in python 5.2 Threading module, Creating thread 5.3 inheriting Thread class 5.4 Using callable object, 5.5 Life cycle of thread, 5.6 Single threaded application, 5.7 Multithreaded application 5.8 We call run () directly? 5.9 Need to start(), method , 5.10 Sleep() & Join(), 5.11 Synchronization - Lock class - acquire(), 5.12 release() functions 5.13 Garbage collection. Python Data Base Communications (PDBC), Introduction of Numpy, Pandas &MatPlotLib, Drawin lots.	1. Threading module, Creating thread 2. We call run () directly? Need to start(),method, Sleep() & Join(),

SW-4Suggested Sessional Work (SW):

a. Assignments:

1. Threading module, creating thread
2. Base Communications (PDBC), Introduction of Numpy.
3. Synchronization - Lock class – acquire (),release() functions

b. Major - Paper I:

c. C. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour(Cl+SW+Sl)
01CA511.1: Develop and execute simplePython programs	15	02	01	18
01CA511.2: Structure a Python program intofunctions	11	02	01	14
01CA511.3: Using Python lists, tuples torepresent compound data	10	02	01	13
01CA511.4: Develop Python Programs for file processing	11	02	01	14
01CA511.5: Implement error handling.	13	02	01	19
Total Hours	60	10	5	78

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Unit1: What is Python:	03	02	03	08
CO-2	Unit2: Control Statements:	03	01	05	09
CO-3	Unit3: Importance of modular:	03	07	02	12
CO-4	Unit4: Procedural v/s Object oriented:	03	05	05	13
CO-5	Unit5: Multithreading and multiprocessing:	03	02	03	08

Total	15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment will be held with written examination of 50 marks

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to ICT
7. Demonstration
8. ICT Based Teaching Learning(Video Demonstration/ Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Python Crash Course	Eric Matthes	A Hands-On, Project-Based Introduction to Programming	2nd Edition
2	The Python Language Reference Manual	Guido van Rossum, and Fred L. Drake	Network Theory Ltd	Revised November 2006

Curriculum Development Team

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CO, PO and PSO Mapping

Course Title: B.C.A
Course Code: 01CA511
Course Title: **Python programming**

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
	Computational information	Difficulty Analysis	Drawing / Improvement of Solutions	Accomplish Investigations of Compound Computing	: Current Implement Procedure	Proficient Principles	Ultimate Education	Mission Administration	Announcement Usefulness	Public & Ecological Alarm	Personality & Group Job	Modernization and Private Enterprise	An ability to enhance the application of knowledge of theory subjects in diverse fields	Develop language proficiency to handle corporate communication demands.	Preparing students in various disciplines of technologies such as computer applications, computer networking, software engineering, JAVA, database concepts and programming	In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced
CO-1:Develop and execute simple Python programs	2	2	3	3	2	1	1	1	1	1	1	3	2	2	3	3
CO-2: Structure a Python program into functions	2	3	2	3	2	2	1	1	1	1	1	3	2	3	2	3
CO-3:Using Python lists, tuples to represent compound data	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2	3

CO-4: Develop Python Programs for file processing	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2
CO-5: Implement error handling	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO-1:Develop and execute simple Python programs	SO1.1 SO1.2 SO1.3		Unit-1.0 **What is Python**:- 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10	As Mentioned in Page no. ____to _____
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO-2: Structure a Python program into functions	SO2.1 SO2.2 SO2.3		Unit-2 Control Statements 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO-3:Using Python lists, tuples to represent compound data	SO3.1 SO3.2 SO3.3		Unit-3: Importance of modular 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO-4: Develop Python Programs for file processing	SO4.1 SO4.2		Unit-4 Procedural v/s Object oriented 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12,4.13,4.14	
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO: 1,2,3,4	CO-5: Implement error handling	SO5.1 SO5.2 SO5.3		Unit5:Multithreading and multiprocessing 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12,5.13,5.14,5.15	

A K S University

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Curriculum of B.C.A (Computer Science& Application) Program

Semester-V

Course Code: 05CA521-A

Course Title: Multimedia And Animation

Pre- requisite: Basic knowledge of computers

Rationale: The aim of the course is to introduce to the field of Multimedia with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach. It explores the essential theory behind methodologies for developing systems that can create new Multimedia technologies like video Editing, animation, image editing.

Course Outcomes:

05CA521-A .1: Demonstrate knowledge of the fundamental principles of multimedia.
05CA521-A .2: Apply Fonts and image fundamentals.
05CA521-A .3: Fundamentals of Audio and Video
05CA521-A .4: Familiarize knowledge representation in Animation.
05CA521-A .5: Comprehend the use of 2D and 3D Animation.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
DSE-1	05CA521-A	Multimedia And Animation	4	0	1	1	6	4

Legend:
CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment5 number	Class Test2 (2 best out of 3)	Seminar one	Class Activity any one (CA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	**(ESA)**	
DSE-1	05CA521-A	Multimedia And Animation	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

05CA521-A .1: Demonstrate knowledge of the fundamental principles of multimedia.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction(CI)	Self-Learning (SL)
SO1.1 Understand the concept of Multimedia **SO1.2** Compare types of Multimedia. **SO1.3** Apply types of Multimedia in real life.	.	**Unit-1.0 Introduction to Multimedia** 1.1 What is multimedia? Multimediaand hypermedia 1.2 Components of multimedia - textual, 1.3 images, graphics, animation,audio, video 1.4 Linear and Non-Linear Multimedia 1.5 Application of Multimedia, 1.6 Requirement of Multimedia System. 1.7 Multimedia Authoring. Multimedia Authoring Metaphors, 1.8 Multimedia Production. Multimedia 1.9 Presentation and tools. 1.10 Automatic Authoring. Editingand Authoring Tools 1.11 Multimedia Hardware, 1.12 Compression, De-compression	1. Search devices using Multimedia 2. Apps using Multimedia .

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Use of Authoring tool.
ii. Use of latest Ms.Word
iii. Applications of Multimedia.

05CA521-A .2: Apply Fonts and image fundamentals.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 Understand the Concept of Fonts andHypertext. **SO2.2** Use the image fundamentals **SO2.3** Demonstrate the useof image editing software.		**Unit-2.0 Fonts and Hypertext** 2.1 Usage of text in Multimedia 2.2 Families and 2.3 Faces of fonts.Outline fonts. bitmap fonts 2.4 **International** character sets and 2.5 Hypertext. Digital font's techniques. 2.6 Image fundamentals 2.7 Image formats, Bitmap and Vector 2.8 Color Models, Color palettes,2D Graphics 2.9 image Compression 2.10 File Formats: GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS. PDF, 2.11 Basic image Processing. Use	1. How Differen t fonts areused. 2. Apply Different image editing software's .

		of image editing software 2.12 Photo Retouching. Image Resolution. Color. Raster and Vector Graphics.	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Difference between fonts and faces.
ii. Difference between bitmap and raster images.
iii. Apply photoshop to edit an image.

05CA521-A .3: Fundamentals of Audio and Video

.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 Understand the concept of Audio **SO3.2** Understand the concept of video. **SO3.3** Apply various audioand video tools.	.	**3.1. Audio fundamentals:** Audio quality, formats and devices, **3.2.** Digitization of sound. frequency and bandwidth, decibel system. data rate **3.3.** audio file format, Sound synthesis. Musical Instrument Digital Interface (MIDI), wavetable **3.4.** Compression and transmission of audio	1. Compare and analyze audio and video editing tools.

		on Internet, **3.5** Editing and adding sound to multimedia project, Audio softwareand hardware. **3.6. Video Fundamental:** Video basics. Formats. how video works **3.7.** Types of video signals - component. compositeand S-video. Analog video, Digital video, **3.7.** Broadcast Video Standards (NTSC, PAL), **3.8** Video Recording and Tape formats. **3.9** Shooting and editing Video, **3.10** Video compressionand File formats (JPEG.MPEG), **3.11** Video software and hardware. **3.12** Case study of the any animated movie.	

SW- Suggested Sessional Work (SW):

Assignments:

- **i.** Application of audio software**.**
- **ii.** Application of the video software.
- **iii.** Difference between different video standards.

05CA521-A .4: Familiarize knowledge representation in Animation.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the concept of Animation. **SO4.2** Use of frames and slots. **SO4.3** Apply animation software.		**Unit-4.0 Animation** 4.1. Introduction and definition of 4.2. animation, Principles 4.3. Types and uses. Methods and 4.4. Techniques of animation, Basic animation 4.5. Text and image animation. 4.6. Time line construction and management. 4.7. Masking Motion and shape 4.8. Twining. Morphing 4.9. Onion skinning. Animation File Formats. 4.10. Keyframe animation, 4.11. Working with symbols and 4.12. Animation Software	1. Compare and analyze all animation techniques.

SW- Suggested Sessional Work (SW):

Assignments:

i. Questions based on frames.
ii. Questions based on motion and shape tween.
iii. Questions based on text and image animation.

05CA521-A .5: Comprehend the use of 2D and 3D Animation.

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the concept of 2D animation. **SO5.2** Understand the concept of 2D animation.		**Unit-5.0 Basics of 2D and 3D animation.** **5.1.** Overview of 2D animation and its features, **5.2.** Drawing tools. types of panels. transformation, property panel **5.3.** working with objects. group, bitmap **5.4.** Controlling Movie clips with code. **5.5** Working with Dynamic Text fields and Input Text Fields. **5.6** Loading external content and other movies. **5.7** Dynamic preloaders **5.8** Interactivity with code. **5.9** Difference between 2D and 3D animation **5.10** Tweening and motion along a path, Controlling movie playback.	1. Compare and analyze all 2D and 3D animation techniques.

		5.11 Text and hyperlink. adding sound and movie. **5**Introduction to 3D animation and its basic concepts, and its applications. **5.12** Case study of the Avtar Movie.	

SW- Suggested Sessional Work (SW):

Assignments:

i. Difference between 2D and 3D animation,
ii. Use of tweening.

Brief of Hours suggested for the Course Outcome

Course Outcomes	**Class Lecture (Cl)**	**Sessional Work (SW)**	**Self-Learning (Sl)**	**Total hour (Cl+SW+Sl)**
05CA521-A .1: Demonstrate knowledge ofthe fundamental principles of multimedia	12	02	01	15
05CA521-A .2: Apply Fonts and imagefundamentals.	12	02	01	15
05CA521-A .3: Fundamentals of Audio andVideo	12	02	01	15
05CA521-A .4: Familiarize knowledge representation in Animation	12	02	01	15
05CA521-A .5: Comprehend the use of 2Dand 3D Animation	12	02	01	15
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Unit1: Introduction to Multimedia**	03	02	03	08
CO-2	**Unit2: Fonts and Hypertext**	03	01	05	09
CO-3	**Unit3: Audio fundamentals**	03	07	02	12
CO-4	**Unit4: Animation**	03	05	05	13
CO-5	**Unit5: Basic 2D and 3D animation**	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	"Multimedia Making It Works	Tay Vaughan	Tata McGraw-Hill.	9th edition 2008
2	Multimedia Systems	Rajneesh Aggarwal & B. B Tiwari	Excel Publication. New Delh	3rd Edition 2002
3	Lecture note provided by Dept. of CS&E, AKS University, Satna.			

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6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: B.C.A (Bachelor of Computer Application)
Course Code: 05CA521-A
Course Title: Multimedia Tools and Application

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Demonstrate knowledge of the fundamental principles of multimedia	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	2	2
CO2: Apply Fonts and image fundamentals.	1	1	2	2	1	2	3	2	2	1	2	2	2	2	2	1	3
CO3: Fundamentals of Audio and Video	2	2	1	1	1	2	2	2	1	2	1	2	1	3	2	2	2
CO4: Familiarize knowledge representation in Animation	3	2	2	3	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Comprehend the use of 2D and 3D Animation	-	-	-	1	1	3	3	1	1	1	2	2	3	3	1	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Demonstrate knowledge of the fundamental principles of multimedia	SO1.1 SO1.2 SO1.3		Unit-1 Introduction to Multimedia 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 Apply Fonts and image fundamentals	SO2.1 SO2.2 SO2.3		Unit-2 Fonts and Hypertext 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: **:** Fundamentals of Audio and Video	SO3.1 SO3.2 SO3.3		Unit-3 Audio fundamentals 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Familiarize knowledge representation in Animation	SO4.1 SO4.2 SO4.3		Unit-4 Animation 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Comprehend the use of 2D and 3D Animation.	SO5.1 SO5.2		Unit-5 Basic 2D and 3D animation 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

Curriculum of BCA (Bachelor of Computer Applications)

(Revised as on 01 August 2023)

Semester-V

Course Code: 05CA521-B

Course Title: Design and Analysis of Algorithms

Pre- requisite: Data Structures and

Rationale: Study of this subject help students to understand different problem-solving skills like divide and conquer, Dynamic programming, Greedy Strategy and Back Tracking. These problem-solving skills will develop intelligence in student to solve real time problems of society and Industry.

Course Outcomes:

05CA521-B.1. Demonstrate knowledge of Graph and its applications.
05CA521-B.2. Apply greedy approach and Huffman coding.
05CA521-B.3. Use various divide and conquer algorithm and recurrence relation
05CA521-B.4. Familiarize with the dynamic programming approach
05CA521-B.5. Comprehend the use of concept of computation and network flow.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
DSE-1	**05CA521-B**	Design and analysis of algorithms	4	0	1	1	6	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Course	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment5 number3 marks	Class Test2(2 best out of 3)10 markseach CT)	Seminar one(SA)	Class Activityany one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
DSE	**05CA52**	Design and Analysis of Algorithms	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

05CA521-B .1: Demonstrate knowledge of Graph and its applications.

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)

SO1.1 Understand the concept of Graph **SO1.2** Compare DFS and BFS **SO1.3** Analyze connectivity of graphs.	.	**Unit-1.0** Applications of Graph Search 1.1 Intro Graph Search algorithms 1.2 BFS 1.3 Application and example of BFS 1.4 DFS 1.5 Application and Example of DFS 1.6 Checking if an undirected graph is 2-edge connected 1.7 Based Examples 1.8 Checking if a directed graph is strongly connected 1.9 Based Examples	1. Discuss terminology related to graph. 2. See applications of graph.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on BFS.
ii. Numerical based on DFS
iii. Numerical based on Graph

05CA521-B .2: Apply greedy approach and Huffman coding.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**

SO2.1 Understand the concept of Greedy approach. **SO2.2** Use of Kruskal and prim algorithms. **SO2.3** Demonstrate the use of Huffman coding.	.	**Unit-2.0** Greedy algorithms 2.1. Introduction to the greedy paradigm 2.2. Some Greedy algorithms 2.3. Examples of activity selection 2.4. Examples of deadline scheduling 2.5. fractional knapsack 2.6. based example 2.7. Kruskal's algorithm for minimum spanning trees 2.8. Based examples 2.9. Huffman coding 2.10. Based examples	1. Prim's algorithm for minimum spanning trees. 2. Examples where greedy algorithms are not optimal.

SW-1 Suggested Sessional Work (SW):

Assignments:

iv. Other algorithms based on Greedy approach.
v. Numerical based on fractional knapsack.
vi. Numerical based on Huffman Coding.

05CA521-B .3: Use various divide and conquer algorithm and recurrence relation.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	0
SW	2

SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the concept of Divide and conquer **SO3.2** Use various Divide and conquer algorithms. **SO3.3** Solve recurrence relation		**Unit-3.0** Divide and Conquer 3.1. Intro to Divide and conquer approach 3.2. Explain why the divide andconquer paradigm is useful. 3.3. Illustrate the paradigm through integer multiplication. 3.4. Writing recurrence relations and solving them. 3.5. Various methods to solve recurrence relation -I 3.6. Various methods to solve recurrence relation -II 3.7. Examples based on recurrence relation 3.8. Further examples from geometry – domination numberof a set of points, 3.9. Identifying maximal points, closest pair of points. 3.10. Linear time algorithm for findingthe median. 3.11. Randomized divide and conquer algorithms: 3.12. randomized quicksort and 3.13. selection	1. Solve some recurrence relations. 2. Modify discussed algorithms (e.g., dividing into three parts instead of two parts, or two unequal parts, etc.)and analyze using recurrences. 3. Some elementary exercises on expectation calculation.

SW-1 Suggested Sessional Work (SW):

Assignments:

vii. Numerical based on Fuzzy logic.
viii. Numerical based on Membership Function.
ix. Numerical based on Genetic algorithm.

05CA521-B .4: Familiarize with the dynamic programming approach.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	2
SL	1
Total	13

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Understand the concept of Dynamic Programming **SO4.2** Understand the concept of shortest paths **SO4.3** Analyze various dynamic programming algorithms.	.	**Unit-4.0** Dynamic Programming and shortest paths 4.1. Computing Fibonacci numbers and why divide-and- conquer is not a good idea. Ideaof storing function calls, tables 4.2. Notion of sub problems and optimal substructure 4.3. Illustration through subset sum 4.4.(integer) knapsack 4.5.longestincreasing subsequence 4.6.longestcommon subsequence 4.7. matrix chain multiplication 4.8. Dijkstra's algorithm for single-source shortest paths 4.9. Bellman-Ford for SSSP with	1. Exercises on dynamic programming.

		negative weights 4.10. Floyd Warshall for APSP	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Questions based on frames.
ii. Questions based on scripts.
iii. Questions based on formal logic.

05CA521-B .5: Comprehend the use of concept of computation and network flow.

Approximate Hours

Item	AppX Hrs
Cl	18
LI	00
SW	02
SL	01
Total	21

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Understand the concept of Network flows. **SO5.2** Understand the concept of computations.	.	**Unit-5.0** Network flows & Intractability 5.1. The maximum s-t flow problemin capacitated networks 5.2. Ford Fulkerson algorithm or maximum flow 5.3. Max-flow min-cut theorem 5.4. integrality of maximum flow for integral capacities 5.5. Applications of max flow to maximum bipartite matching, max disjoint paths 5.6. Models of computation	1. Exercises on reductions 2. Exercises on NP-completeness. 3. Problems which areNP-hard but not in NP. 4. Examples of poly time reductions.

		5.7.Turing machines 5.8.PRAM model 5.9.Brief discussion on other modelsof computation e.g. PRAM model 5.10. Memory Hierarchy 5.11. Notion of polynomial time computation 5.12. Polynomial time reductions 5.13. Yes and No instances of decision problems 5.14. Decision vs optimization. 5.15. NP as a class of problems with Yes certificates which can be efficiently checked 5.16. NP-hardness and Cook-Levin theorem (just the statement). 5.17. NP-completeness. 5.18. Examplesof Reductions.	

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Different types of learning techniques.
ii. Use of Dempster-Shafer Theory of Evidential reasoning

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
05CA521-B .1 Demonstrate knowledgeof Graph and its applications.	09	02	01	13
05CA521-B .2. Apply greedy approachand Huffman coding.	10	02	01	13

05CA521-B .3. Use various divide and conquer algorithm and recurrence relation	13	02	01	16
05CA521-B .4. Familiarize with thedynamic programming approach	10	02	01	13
05CA521-B .5. Comprehend the use of concept of computation andnetwork flow.	18	02	01	21
Total Hours	60	10	5	66

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Applications of Graph Search	03	02	03	08
CO-2	Greedy algorithms	03	01	05	09
CO-3	Divide and conquer	03	07	02	12
CO-4	Dynamic Programming and shortest paths	03	05	05	13
CO-5	Network flows & Intractability	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment will be held with written examination of 50 marks
Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry
7. Demonstration
8. ICT Based Teaching Learning (Video

Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)

9. Brainstorming

Suggested Learning Resources:

A. Books:

S.No.	Title	Author	Publisher	Edition &Year
1	Algorithm Design	Jon Kleinberg and Éva Tardos	Pearson.	1st Edition
2	Algorithms	Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani	MIT Press	3rd Edition
3	Introduction to Algorithms	Thomas H Cormen, Charles E Lieserson, Ronald L Rivestand Clifford Stein	McGraw-Hill	2nd Edition
4	Algorithm Design: Foundations, Analysis, and Internet Examples	Michael TGoodrich and Roberto Tamassia	Wiley	2nd Edition

B. Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Design and Analysis of Algorithms	Prof. Madhavan Mukund	Chennai Mathematical Institute
2.	Design and Analysis of Algorithms	Prof. Abhiram Ranade	IIT Bombay

Curriculum Development Team

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6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

CO, PO and PSO Mapping

Course Title: B.C.A.
Course Code: 05CA521-B
Course Title: **Design and Analysis of Algorithm**

urse Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
	Computational information	Difficulty Analysis	Drawing / Improvement of Solutions	Accomplish Investigations of Compound Computing Troubles	: Current Implement Procedure	Proficient Principles	Ultimate Education	Mission Administration	Announcement Usefulness	Public & Ecological Alarm	Personality & Group Job	Modernization and Private Enterprise	An ability to enhance the application of knowledge of theory subjects in diverse fields	Develop language proficiency to handle corporate communication demands.	Preparing students in various disciplines of technologies such as computer applications, computer networking, software engineering, JAVA, database concepts and programming	In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced
CO.1 Demonstrate knowledge of Graph and its applications.	3	2	3	3	2	1	1	1	1	2	1	3	2	2	3	3
CO2. Apply greedy approach and Huffman coding.	2	3	3	3=2	2	2	1	2	1	2	1	3	2	3	2	3
CO3. Use various divide and conquer algorithm and recurrence relation	2	2	2	3	2	2	2	1	1-2	1	1	3	2	2	2	3
CO4. Familiarize with the dynamic programming approach	2	2	3	2	2	2	1	1	1	1	2	3	2	2	3	2
CO5. Comprehend the use of concept of computation and network flow.	2	2	3	2	2	2	1	1	1	1	1	3	2	2	3	2

Course Curriculum Map

POs & PSOs /*-No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self Learning(SL)
PO: 1,2,3,4,5,6,7,8,9, 10,11,12 PSO:1,2,3,4	CO.1 Demonstrate knowledge of Graph and its applications	SO1.1 SO1.2 SO1.3		Unit-1.0 Applications of Graph Search 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As Mentioned in Page no._____to
PO: 1,2,3,4,5,6,7,8, 9,10,11,12 PSO:1,2,3,4	CO.2 Apply greedy approach and Huffman coding	SO2.1 SO2.2 SO2.3		Unit-2 Greedy algorithms 2.1, 2.2, 2.3, 2.4, 2.5, 2.6,2.7,2.8,2.9,2.10	
PO: 1,2,3,4,5,6,7,8, 9,10,11,12 PSO:1,2,3,4	CO.3 Use various divide and conquer algorithm and recurrence relation	SO3.1 SO3.2 SO3.3		Unit-3: Divide and Conquer 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12,3.13	_____
PO: 1,2,3,4,5,6,7,8, 9,10,11,12 PSO:1,2,3,4	CO.4 Familiarize with the dynamic programming approach	SO4.1 SO4.2 SO4.3		Unit-4 : Dynamic Programming and shortest paths 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO: 1,2,3,4,5,6,7,8, 9,10,11,12 PSO:1,2,3,4	CO.5 Comprehend the use of concept of computation and network flow	SO5.1 SO5.2		Unit5: Network flows & Intractability 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12, 5.13,5.14,5.16,5.17,5.18	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) **Program**

(Revised as on 01 August 2023)

Semester-V

Course Code: 06CA551

Course Title: Field Project

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale:

- To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.
- To modify/ improve the existing engineering / professional systems.
- To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.
- To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

06CA551.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
06CA551.2: - The student will be able to implement the project plan and manage the project.
06CA551.3: - The student will be able to present the completed project work.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Project	06CA551	Field Project	0	12	0	0		6

Introduction to Project Work

Project work is a very important course in all branches of diploma programmes. It offers following opportunities to students of final semester: -

1. To learn skills and abilities which are otherwise not possible either inclassroom or in structured environment of laboratory such as: -
   - Skill to work in groups or teams,
   - Skill to face real life professional problems and to create reallife solutions for them.
   - Skill to take professional decisions under real life constraints andcircumstances,
   - Skill to learn in self-directed way to pursue the specific professional projects (Self Directed Learning)
   - Skill to learn from real life self- experiences (l i f e l o n g learning)
   - Skill to manage the real- l i f e engineering / professional projects
   - Skill to plan and organize the self / group professional work
   - skills to apply the engineering management principles in real lifeprofessional projects
   - Skill to defend / justify self- real life engineering / professionalwork in front of

significant others

- Skill to complete the professional tasks / work keeping in viewsocietal, legal and environmental considerations
- Skill to collect relevant data in real life situations
- Skill to relate engineering / professional knowledge gained in various semesters with real life engineering / professional problems
- Skill to estimate the duration and costs in real life engineering / professional work
- Skill to assess the theoretical feasibility, financial feasibility and time feasibility of real-life engineering / professional tasks.

With an objective to ensure the learning of above skills and abilitiesas well as to earn maximum marks in NBA assessment,

The Course on Project Work consists of five phases: -

	Description of phases	Learn Hrs.
1	Literature / industry's need survey and finalization of topic / title	15Hrs
2	Detailed planning of the project work	
3	Implementing the detailed project plan	60Hrs
4	Managing the project activities	
5	Reporting of the project work output/outcome / prototype	15Hrs
	Total	90 Hrs

General Guidelines for Project Work

- The project topics should be related to concerned branch of engineering / profession, but, should not be the exact content of the curriculum taughtin the discipline.
- Student's project topics should be preferably 'real life' topics. It means the project topics should have substantial element of uncertainty, complexity and multi-disciplinary-ness which can be coped up by the students. These elements offer opportunities to students to apply engineering/ professional knowledge in real life settings, solve real life problems and to take real life decisions. As a project guide, concerned teacher should ensure these by suitably altering / framing / reframing the statement of topic / title.
- The project topics should be such that students can get opportunity to refer IS codes, Manuals, Handbooks, norms and standards, opportunity to conduct standard tests, and opportunity to operate modern laboratory equipment's following SOPs.
- For student's interest, active participation and ownership in the project work, their self-motivation is necessary. Therefore, students should be actively involved in finalizing the topic of project.
- Students should be asked to conduct a brief review of literature for problems and issues in their engineering / professional areas of interest,where they think they can contribute effectively. The project guide should facilitate them in this regard, through his/her expertise and experience.

Every student group should be asked to propose at least three topics oftheir interest.

- The topics proposed by student project groups should be assessed bythe facilitator-teacher on following three criteria: -
  - **The work on the topic should be theoretically and practically feasible.**
  - **The project work on the topic should be completed withinapprox. Three and half months.**
  - **Availability of required resources should be certain. Cost ofproject work should also be bearable.**
- Normally, students' project works should be carried out in small groups (1 to 2 students).
- All faculty members of department should be engaged as project guides. Every faculty member should be project guide of at least one student project group.
- Normally, project guides should be assigned to the students through lottery system and students under each faculty should be asked to formtheir small groups.

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

COs, POs and PSOs Mapping

Course Title: BCA

Course Code: 06CA521

Course Title: Project-Field Project

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	2	3	3	2	3	2	3	1	3	1	3	3	2	3	3	1	2
CO 2: The student will be able to implement the project plan and manage the project.	2	3	3	2	3	2	3	1	3	1	3	3	2	2	2	2	3
CO 3: The student will be able to present the completed project work.	2	2	3	1	3	2	2	1	3	1	3	3	2	3	2	2	2

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, ,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	-	-	-	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: The student will be able to implement the project plan and manage the project.	-	-	-	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: The student will be able to present the completed project work.	-	-	-	

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-VI

Course Code: 01CA611

Course Title : Web Technology

Pre- requisite: Student should have basic knowledge of Signal, Circuit, Computer fundamentals.

Rationale: Study of this subject will develop different skills in students to create and manage the websites. Concepts like Html, CSS and JavaScript will helpful to develop front end design of website. And knowledge of PHP will help students to develop back-end design. Advance concepts like Angular and React will help students to make website dynamic.

Course Outcomes:

On successful completion of this course, the students will

01CA611.1: Have knowledge of HTML, its essential tags, Attributes, Text styles, Links to External Documentsand different sections of a HTML page.

01CA611.2: Develop skills to generate HTML and CSS page and have knowledge of JavaScript assisted style sheets (JSSS).

01CA611.4: Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants, Embedding PHP in HTML pre-defined and used defined, Have knowledge of Angular JS, XML Fundamentals, J Query

01CA611.5: Develop skills to generate Static and dynamic application designing, Google form designing, Django

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Major	01CA611	Web Technology	4	4	1	1	10	6

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks	Class Test 2 (2 best out of 3) 10 marks	Seminar one (SA)	Class Activity any one	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+A		
Major	01CA611	Web Technology	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Major	01CA611	Web Technology-Lab	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels,

which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

01CA611.1: Have knowledge of HTML, its essential tags, Attributes, Text styles, Links to External Documents and different sections of a HTML page.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Understand basics of HTML SO1.2 Understanding various tags used with HTML SO1.3 Understanding types of List in Html. SO1.4 Understanding different input types SO1.5 Understand client server architecture. .	LI1.1 Design web pages for your college containing a description of the courses, departments, faculties,library, etc, use href,list tags. LI1.2 Create your class timetable using the table tag. LI1.3 Create user Student feedback form (use textbox, text area, checkbox, radio button, select box, etc.) LI1.4. Design web pages for your hobbies. LI1.5. Design web pages for a retail shop LI1.6. Design web	Unit-1.0 Topics Basics of Internet and Web **1.1** Introduction to HTML **1.2** Essential Tags **1.3** Tags and Attributes **1.4** Text Styles and Text **1.5** An-arguments, **1.6** Text, Effects Event **1.7** coupling tools, Form elements **1.8** Table layout and presentation **1.9** Use of different input types .List types **1.10** various tags: Canvas, **1.11** DIV and SPAN **1.12** Introduction to basic client-side technologies	1. Learning various concepts related with internet.

	pages for a ecommerce ssite.		

SW: Suggested Sessional Work (SW):

a. Assignments:

i. Explain basic terminologies used with HTML.

ii. Explain various types of tags.

b. Mini Project:

01CA611.2: Develop skills to generate HTML and CSS page and have knowledge of Java Script assistedstyle sheets (JSSS).

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
O2.1 To Understand the concept of web server. **SO2.2** To learn about Cascading Style Sheet. **SO2.3** To implement VB Script and Java Script. **SO2.4** To understand Document Object Model. **SO2.**5 To learn about JRE (JavaScript Runtime	LI2.1 Create a web page using the frame. Divide the page into two parts with LI2.2 Create your resume using HTML tags also experiment with colors, text, links, size, and also othertags you studied. LI2.3 Create a web page by making use of the following tags: Head, Body, Bgcolor. LI2.4 Write a HTML program to implement different types of CSS.	Unit-2 **Web Client and Web Sever** 2.1 Cascading Style Sheet-Introduction 2.2 types of CSS and its static and 2.3 dynamic applications 2.4 JavaScript- Basics of JavaScript technology 2.5 Control statements. 2.6 Document Object Model. 2.7 Events, functions, Array 2.8 JRE (JavaScript Runtime Environment)	i.Try to Implement VB Script and Java Script

Environment).	LI2.5 Give an example of Loop control in javascript LI2.6 Give an example of selection control in javascript	2.9 And its applications. 2.10 Embedding JavaScript in 2.11 HTML and 2.12CSS run time data communications	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

i. Explain client-side scripting VBScript and JavaScript.
ii. Explain web database connectivity using DBC and ODBC.

b. Mini Project:

Create an image mapping.

01CA611.3: Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants, EmbeddingPHP in HTML pre-defined and used defined.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction(LI)**	**Class room Instruction(CI)**	**Self- Learning (SL)**
SO3.1 Learning server-side scripting language PHP. **SO3.2** Will learn PHP Syntax, Comments Tags and	LI3.1 Acquaintance with elements, tags and basic structure of HTMLfiles. LI3.2.Practicing basic and advanced text for formatting. LI3.3 Practice use of image,video and sound in HTMLdocuments LI3.4 Designing of web pages- Document layout, list, tables. LI3.5	**Unit-3 : PHP** 3.1 Introduction to server-side scripting language PHP. 3.2 Data types in PHP 3.3 PHP Syntax, Comments Tags and Attributes 3.4 Variables and Constants 3.5 Embedding PHP in HTML 3.6 CSS and JavaScript run time data communications 3.7 pre-defined and used defined Functions	1. Learning various attribute s of HTML tags. 2.Learning online HTML editors.

Attributes .**SO3.3** Learn CSS and JavaScript run time data communications . **SO3.4** Creating forms using HTML. **SO3.**5 Implement front end to back end any data base communication	PracticingHyperlinkof web pages, working with frames. LI3.6 Working with formsand controls.	3.8 Strings functions and Array 3.9 CRUD3.10 ront end to back end any data base communication3.11 Learn by example 3.12 Case Study	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i. Explain basic PHP tags and their properties.
ii. Create an HTML page that contains a CSS.

b. Mini Project:

iii. Create an admission form using HTML tags & CSS.

c. Other Activities (Specify):

Use of latest editors for web development like. VS Code, Notepad++ etc.

01CA611.4: Have knowledge of Angular JS, XML Fundamentals, J Query

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	1
SL	1

Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understanding Angular JS . **SO4.2** Learn XML Fundamentals **SO4.3** Learn J Query **SO4.4** Learn Accessing Data from XML Documents **SO4.**Understand working of JSON.	LI4.1 Create a web form using php for login page. LI4.2 Create a simple xml document with following details: Rollno, Sname, Contact, Email & Address. LI4.3 Write a simple PHP script to perform crud operations. LI4.4 Create a web form using php for enquiry details. LI3.5 Working with background,text, font, list Properties LI3.6 Create a XML document	**Unit-4 :** 4.1 Introduction to Angular JS 4.2 MVC Architecture and Angular JS applications 4.3 XML: - Introduction, 4.4 XML Fundamentals 4.5 XML Syntax, Accessing Data from 4.6 XML Documents 4.7 J Query Introduction, 4.8 J Query Syntax 4.9 J query selectors, Events 4.10 working with JSON. 4.11 learn by example 4.12 Case Study	i. Differentiate between HTML and DHTML. ii. Learn CSS and JSSS.

SW-4 **Suggested Sessional Work (SW):**

a. Assignments:

i. Write down the features of Angular JS.

ii. Explain XML.

a. Mini Project:

i. Design a page And use Angular JS.

b. Other Activities (Specify):

Implementing CSS in your previously created web page.

01CA611.5: Develop skills to generate Static and dynamic application designing, Google form

designing,Django

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Learn Static and dynamic application designing. **SO5.2** Implementing Google forms. **SO5.3** Learn Django **SO5.4** Implementing template customization and developdynamic applications **SO5.**5 Learn MVT (ModelView Template) with Django.	LI5.1 Customize a template using Django LI5.2 Create a MySQL data base and connect with PHP. LI5.3 Write PHP script for storing and retrieving user information from my SQL table. LI5.4. Write a HTML page which takes Name, Address, Email and Mobilenumber from user(register PHP). LI5.5. Store this data in MySQL data base. Next page displays all user in HTML table using PHP (display PHP). LI5.6 Write a PHP program to print first ten Fibonacci numbers	**Unit-5** Static dynamic application designing dynamic application designing Google form designing. customerreview panel Introductionto Django MVT (Model View Template) with Django template customization develop dynamic applications 4.10 Learn by Example 4.11 Case Study 4.12 Develop Application	1. Learn PHP as server side scripting. 2. Use PHP to connect any database.

SW-5 Suggested Sessional Work (SW):

a. Assignments

i. Write a PHP program to print first ten Fibonacci numbers.

ii. Create HTML page with java script which takes integer number as a input and tells whether the number is divisible by 4 or not.

b. Mini Project:

i. Using HTML, CSS, Java script, PHP, MySQL, design and authentication module of a web page.

c. Other Activities (Specify):

Create form validation using PHP.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
01CA611.1: Have knowledge of HTML, it's essential tags, Attributes, Text styles, Links to External Documents and different sections of a HTML page.	12	2	1	15
01CA611.2: Develop skills to generate HTML and CSS page and have knowledge of Java Script assisted style sheets (JSSS).	12	2	1	15
01CA611.3**:** Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants, EmbeddingPHP in HTML pre-defined and used defined.	12	2	1	15
01CA611.4 : Have knowledge of Angular JS, XMLFundamentals, J Query.	12	2	2	16
01CA611.5 : Develop skills to generate Static and dynamicapplication designing, Google form designing, Django	12	2	2	16
Total Hours	60	10	7	77

Suggestion for End Semester Assessment

A K S University

Faculty of Engineering and Technology

Department of Computer Application & Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Topics Basics of Internet and Web	02	01	01	04
CO-2	Web Client and Web Sever	02	06	02	10
CO-3	PHP	03	07	05	15
CO-4	Angular JS, XML Fundamentals, J Query	02	10	05	17
CO-5	Google form designing, Django	03	02	02	07
Total		12	26	15	53

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Web Technology will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Beginning PHP5, Apache, and MySQL Web Development	Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz	Glass Wrox Publication	2005

2	Beginning HTML, XHTML, CSS, and JavaScript 2010	Jon Duckett	Wiley Publishing	2010
3	Web Technologies, Black Book, Dream Tech Press 2010	Kogent	Learning Solutions Inc Dream Tech Press	2010
4	HTML, XHTML and CSS Bible	Bryan Pfaffenberger, Steven M. Schafer, Chuck White	**John Wiley & Sons**	2004

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COs, POs and PSOs Mapping

Program: BCA
Course Code: 01CA611
Course Title: Web Technology

	Program Outcomes												Program Specific Outcome				
	PO	PO	PO	PO 4	PO 5	PO	PO 7	PO	PO 9	PO	PO 11	PO	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
Course Outcomes	Engineering	Problem analysis	Design/developm	Conduct studies	Utilization of	Engineers and	Environment and	Ethics	Individual and	Communication	Project management and	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend,evaluate, and create computer Programmesin the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer- based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering toolsto develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologiesin the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the helpof AI and Data Science Technologies.

CO1: Have knowledge of HTML, its essential tags, Attributes, Text styles, Links to External Documents and different sections of a HTML page.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**	**2**
CO2: Develop skills to generate HTML and CSS page and have knowledge of Java Script assisted style sheets (JSSS).	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3: Have knowledgeof PHP, PHP Syntax, Comments, Variables and Constants, Embedding PHP in HTML pre-defined and used defined.	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO4 : Have knowledge of Angular JS, XML Fundamentals, J Query	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO5 : Develop skills to generate Static and dynamic application designing, Google form designing, Django	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Have knowledge of HTML, it's essential tags, Attributes, Text styles, Links to External Documents and different sections of a HTML page.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 Topics Basics of Internet and Web 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Develop skills to generate HTML and CSS page and have knowledge of Java Script assisted style sheets (JSSS).	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 Web Client and Web Sever 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO3 :** Have knowledge of PHP, PHP Syntax, Comments, Variables and Constants, Embedding PHP in HTML pre-defined and used defined.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** pHp 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4 : Have knowledge of Angular JS, XML Fundamentals, J Query	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Angular JS, XML Fundamentals, J Query 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5 : Develop skills to generate Static and dynamic application designing, Google form designing, Django	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 Google form designing, Django 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

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Semester-VI

Course Code: 05CA621-A

Course Title : AI and Data science

Pre-requisite: Basic knowledge of Data Structures, Data Management and Matrices.

Rationale: The purpose of this course is to provide an introduction to Artificial Intelligence (AI) and its application in solving real-world problems that are hard to articulate using traditional algorithmic approaches. The course covers the fundamental concepts behind different methodologies for creating intelligent systems that can deal with uncertainty, learn from Experience, and apply problem-solving strategies inspired by nature.

Course Outcomes:

05CA621-A .1: Demonstrate knowledge of the fundamental principles of Artificial Intelligence.
05CA621-A .2: Apply different searching techniques.
05CA621-A .3: Demonstrate knowledge of Data Science.
05CA621-A .4: Familiarize knowledge representation in Data science.
05CA621-A .5: Comprehend the use of Python

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
DSE-2	05CA621-A	AI and Data Science	3	0	2	2	8	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teachers to ensure the outcome of Learning.

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Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment	Class Test 2 (2 best out of 3)	Seminar one	Class Activity	Class Attendance (AT)	Total Marks		
DSE-2	**05CA62**	AI and Data science	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO1: Demonstrate knowledge of the fundamental principles of Artificial Intelligence.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	3
SL	2
Total	17

Session Outcomes (SOs)	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning (SL)
SO1.1. Understand the oncept of Artiicial Intelligence **SO1.2.** Comparet ypes of Intel lige ntagents. **SO1.3.** Apply types of intel ligent age t'sreal **SO1.4.** Understand AI approach es **SO1.5** Recall applications of AI		**Unit-1: Introduction to AI** 1.1 Definitions, Goals of AI 1.2 AI Approaches 1.3 AI Techniques 1.4 Branches of AI, 1.5 Applications of AI. 1.6 Intelligent Agents: 1.7 Learn by example 1.8 Definition of a rational agent 1.9 reflex model based1.10 1.10 tility-based agents1.11 he environment in which particular agent operates 1.12 Case study	1. Search devices using artificial intellige nce 2. Search devices usingintell igentagent s.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Explain AI approaches.
2. Discuss different agents in AI.
3. Write AI techniques.

b. Other Activities (Specify):

Seminar and Tutorial

CO2: Apply different searching techniques.

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	0
SW	3
SL	2
Total	19

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Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
1. Understand the concept of problem Solving. **SO2.2.** Use the Horn's logic in problems **SO2.3.** Recall Heuristic search techniques **SO2.4.** Apply Rules: Knowledge representation, predicate logic **SO2.5**. Discuss Unification algorithm		**Unit-2 Problem-solving** 2.1 Problem-Solving, Search, and Control Strategies 2.2 Search and control strategies, Exhaustive searches 2.3 Heuristic search techniques 2.4 Constraint satisfaction problems (CSPs) 2.5 Models 2.6 Knowledge Representation, Predicate Logic 2.7 Rules: Knowledge representation, KR using predicate logic 2.8 KR using rules, Resolution 2.9 Unification Algorithm 2.10 First-order predicate Calculus 2.11 Skolemization, Horn's Calculus 2.12 Semantic network 2.13 Frame system and value inheritance 2.14 Scripts and conceptual Dependency.	1. How Predicate logic is used to solve real life problems. 2. Numerical based on Predicate Logic.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Explain Heuristic search techniques.
2. Discuss First-order predicate Calculus.
3. Unification algorithm.

b. Other Activities(Specify):

Seminar and Tutorial

CO3: Demonstrate knowledge of Data Science.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	3
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
O3.1. Understand the concept of Data Science. **SO3.2.** Use of various datascience toolkits. **SO3.3.** Apply various classification data **SO3.4.** Recall different types of data		**Unit-3 : Introductionto data Science** 3.1 Definition, Data sciencein various fields, Impact of Data Science, 3.2 Data Science tool kit 3.3 Understanding of Data 3.4 Types of data:Numeric, Categorical 3.5 Graphical and multidimensional data 3.6 Classification of digitaldata:Structured 3.7 Semi-structure d, Unstructured 3.8 Sources of Data: Time Series, Transactional data Biological data, Spatial data 3.9 Social networkdata, Data analytics life cycle 3.10 Compare and analyzell data	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss different libraries in Data Science.
2. Explain different types of Data.
3. Discuss the classification of digital data.

b. Other Activities(Specify):

Seminar and Tutorial

CO4: Familiarize knowledge representation in Data science.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	0
SW	3
SL	2
Total	16

Session Outcomes(SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction(CI)**	**Self- Learning (SL)**
O4.1. Understand the concept of data collection strategies. **SO4.2.** Explain Data Discretization **SO4.3.** Use of classification and prediction. **SO4.4.** Recognize featuresof data **SO4.5.** Apply logistic regression, decisiontree algorithms in real-world problem		**Unit-4 : Data collection strategies** 4.1 Data pre-processing overview, Data cleaning 4.2 Data integration and transformation, 4.3 Data reduction, Feature selection 4.4 Dimensionality reduction 4.5 Data Discretization 4.6 Basic concepts of classification and	1. Study different types of data preprocessing 2. Study different models based on classification algorithms

		prediction 4.7 General approach to solving a classification problem 4.8 Logis regressi on, Decision tree 4.9 Random forest, Bayesian classific ation 4.10 Evaluatingthe accuracy ofthe classifier/predict 4.11 Model selection	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss the importance of Feature selection in data analytics.
2. Explain the Decision tree algorithm.
3. How to calculate the accuracy in classifier.

b. Other Activities(Specify):

Seminar and Tutorial

CO5: **Comprehend the use of Python.**

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	3
SL	2
Total	17

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**

SO5.1. Recall Basics of Python **SO5.2.** Differentiate Tuples, Dictionaries **SO5.3.** Explain loop concepts **SO5.4.** Describe data Preprocessing. **SO5.5.** Develop codes in Python		**Unit 5** : **Introduction to Python language** 5.1 Data TypesanD 5.2 Variables 5.3 Basic input-output 5.4 Operators, 5.5 Conditional Execution 5.6 loops 5.7 List and list processing 5.8 Dictionaries, 5.9 Tuples, Strings, Functions 5.10Data Processing, 5.11 Reading and writing data in various formats 5.12 Python librariesfor data science	1. Study different formats of Data 2. Study different library functions

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss various operations on Data.
2. Explain the list concept and operation son List.
3. Use different libraries and perform operations on Data.

b. Other Activities(Specify):

Seminar and Tutorial

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)

XYZ01.1: Demonstrate knowledge of the fundamental principles of Artificial Intelligence.	12	2	1	15
XYZ01.2: Apply different searching techniques.	12	2	1	15
XYZ01.3: Demonstrate knowledge of Data Science.	12	2	1	15
Familiarize knowledge representation in Data science.	12	2	1	15
XYZ01.5: Comprehend the use of Python	12	2	1	15
Total Hours	60	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Demonstrate knowledge of the fundamental principles of Artificial Intelligence.	05	02	02	09
CO2	Apply different searching techniques.	02	03	05	10
CO3	Demonstrate knowledge of Data Science.	02	03	06	11
CO4	Familiarize knowledge representation in Data science.	2	03	05	10
CO5	Comprehend the use of Python	-	05	05	10
Total		11	16	23	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Problem Solving and Programming will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Artificial Intelligence: Structures and strategies for Complex Problem Solving	Luger G.F. and Stubblefield W.A.	Addison Wesley	6th edition 2008
2	Artificial Intelligence: A Modern Approach	Russell S. and Norvig P	Prentice-Hall	3rd Edition 2009
3	Data Science and Machine Learning using Python	Dr Reema Thareja	McGraw Hill	August 2022

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: BSC
Course Code: 05CA621-A
Course Title: AI and Data Science

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1: Demonstrate knowledge of the fundamental principles of Artificial Intelligence.	2	2	3	3	2	1	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO2: Apply different searching techniques.	2	3	2	3	2	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**	**2**
CO3: Demonstrate knowledge of Data Science.	2	2	2	3	2	2	1	1	1	1	1	3	**1**	**1**	**2**	**2**	**2**
CO4: Familiarize knowledge representation in Data science.	2	2	3	2	2	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**	**2**
CO5: Comprehend the use of Python	2	2	3	2	2	2	1	1	1	1	1	3	**2**	**3**	**1**	**1**	**2**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO1: Demonstrate knowledge of the fundamental principles of Artificial Intelligence.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction to AI 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.10	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO2: Apply different searching techniques.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Problem-solving 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13,2.14,2.15	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Demonstrate knowledge of Data Science.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** Introduction to data Science 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO4: Familiarize knowledge representation in Data science.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Data collection Strategies 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5: Comprehend the use of Python	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Introduction to python language 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application& Information Technology

BCA (Bachelor of Computer Applications)

Semester-VI

Course Code: 05CA621-B

Course Title: Data Warehouse and Mining

Pre-requisite: Database Management System

Rationale: Data Warehouse and Mining is important because it helps to process and store large amount of data sets.

Course Outcomes:

05CA621-B .1: Students should be familiar with various characteristics of the data warehouse.
05CA621-B .2: Learn how data can be stored in data warehouse into its specified architecture.
05CA621-B .3: Understand data mining from basic to advance, including various useful tools and techniques.
05CA621-B .4: Implement data classification and clustering using various algorithms.
05CA621-B .5: Implement advance mining techniques with association rules.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
DSE-2	05CA621-B	Data Warehouse and Mining	4	0	2	1	7	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecture(L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
DSE-2	05CA62	Data Warehouse and Mining	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

05CA621-B .1: Students should be familiar with various characteristics of the data warehouse.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	6
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO1.1 Understanding data warehousing definition, usage, and trends. **SO1.2** Understanding data warehouses and statistical databases. **SO1.3** Understanding multidimensional data model. **SO1.4** Understanding stars, snowflakes, and fact constellations.		**Unit-1.0 Data Warehouse Basic** 1.1 Data Warehousing Definition, 1.2 Usage and Trends, 1.3 DBMS vs. Data Warehouse, 1.4 Statistical Databases vs. Data Warehouses. 1.5 Data Marts, Metadata, 1.6 Multidimensional Data Model, 1.7 Data Cubes, 1.8 Schemas for Multidimensional Database: 1.9 Stars, Snowflakes and 1.10 Fact Constellations. 1.11 Learn by example 1.12 Case Study	Learning basics of data warehouse trends and technology.

SW-1 Suggested Sessional Work (SW):

a. Assignments:
1. Data Marts
2. Data Cubes

b. Mini Project:
Multidimensional Data Model

c. Other Activities (Specify):
NA

05CA621-B .2: Learn how data can be stored in data warehouse into its specified architecture.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	6
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO2.1 Understanding data warehouse storage and architecture. **SO2.2** Understanding distributed and virtual data warehouse. **SO2.3** Understanding data consolidation and warehouse internals. **SO2.4** Understanding online analytical processing system.		**Unit-2.0 Storage and Architecture of Data Warehouse** 2.1 Data warehouse process & architecture, 2.2 OLTP vs. OLAP, 2.3 ROLAP vs. MOLAP 2.4 Types of OLAP servers, 2.5 3-Tier data warehouse architecture, 2.6 Distributed and 2.7 virtual data warehouses, 2.8 Data warehouse manager, 2.9 Data consolidation, 2.10 Warehouse internals, 2.11 Storage and Indexing, Operations, Materialized, 2.12 Online analytical processing (OLAP) system.	Learning storage architecture of data warehouse.

SW-2 Suggested Sessional Work (SW):

a. Assignments:
1. Bayes Theorem
2. ROLAP vs. MOLAP

b. Mini Project:
3-Tier data warehouse architecture

c. Other Activities (Specify):
NA

05CA621-B .3: Understand data mining from basic to advance, including various useful tools and techniques.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	6
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO3.1 Understanding various tools and applications of data mining. **SO3.2** Understanding data mining query language. **SO3.3** Understanding various data mining techniques. **SO3.4** Understanding hypothetical testing.		**Unit-3.0 Data Mining Basic** 3.1 Data mining definition & task, 3.2 KDD versus data mining, 3.3 Tools and applications. 3.4 Data mining query languages, 3.5 Preprocessing, 3.6 Regression 3.7 Pattern presentation & 3.8 visualization specification, 3.9 Tools and applications. 3.10 Data mining techniques: Statistical perspective, 3.11Bayes Theorem, 3.12 Hypothetical testing.	Learning data mining tools and techniques.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Data mining query languages
2. Data mining techniques

b. Mini Project:

Bayes Theorem

c. Other Activities (Specify):

NA

05CA621-B .4: Implement data classification and clustering using various algorithms.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	6
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO4.1 Understanding statistical based and distance-based learning. **SO4.2** Understanding major issues with classification technique. **SO4.3** Understanding clustering technique useful in data mining. **SO4.4** Understanding various hierarchical algorithms.		**Unit-4.0 Classification and Clustering** 4.1 Issues in classification, 4.2 Statistical Based Algorithms, Distance Based Algorithms, 4.3 Decision Tree Based Algorithms, ID3, C4.5, 4.4 Evaluating the Performance. 4.5 Clustering: Basic concepts, 4.6 Partition algorithms, 4.7 Agglomerative 4.8 Hierarchical algorithms, 4.9 DBSCAN, BIRCH, 4.10 CURE Algorithm. 4.11 Clustering with categorical attributes, Comparison 4.12 Case Study	Learning classification and clustering techniques in data mining.

SW-4 Suggested Sessional Work (SW):

a. Assignments:
1. Distance Based Algorithms
2. Statistical Based Algorithms

b. Mini Project:
Clustering

c. Other Activities (Specify):
NA.

05CA621-B . 5: Implement advance mining techniques with association rules.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	6
SW	2
SL	1
Total	21

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understanding core concept of frequent itemset generation and rule generation. **SO5.2** Understanding compact representation of frequent itemset. **SO5.3** Understanding principal component analysis. **SO5.4** Understanding spatial mining and temporal mining.		**Unit-5.0 Association Rules** 5.1 Frequent Itemset generation, 5.2 Apriori Algorithm. 5.3 Rule Generation, 5.4 Compact representation of frequent Itemset 5.5 Advanced Topics: 5.6 Dimensionality 5.7 Reduction, 5.8 Overview of Principle Component 5.9 Analysis and SYD, 5.10 Spatial Mining, and Temporal Mining. 5.11 Web Mining, 5.12 Case Study	Learning various algorithms applicable in data mining.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Itemset Generation
2. Rule Generation

b. Mini Project:

Principal Component Analysis

c. Other Activities (Specify):

NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO1: Students should be familiar with various characteristics of the data warehouse.	12	3	2	1	18

CO2**: L**earn how data can be stored in data warehouse into its specified Architecture.	12	3	2	1	18
CO3: understand data mining from basic to advance, including various useful tools and techniques.	12	3	2	1	18
CO4: implement data classification and clustering using various algorithms.	12	3	2	1	18
CO5: Implement advance mining techniques with association rules.	12	3	2	1	18
Total Hours	60	15	10	5	90

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Students should be familiar with various Characteristics of the data warehouse.	02	05	01	08
CO2	Learn how data can be stored in data Warehouse into its specified architecture.	02	03	05	10
CO.3	Understand data mining from basic to advance, including various useful tools and Techniques.	02	03	07	12
CO4	Implement data classification and clustering using various algorithms.	1	3	7	10
CO5	Implement advance mining techniques with association rules.	1	05	05	10
Total		13	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Data Mining: Concepts and Techniques	Han and Kamber	Morgan Kaufmann Publications	2011, 1st Edition
2	Data Mining Techniques	A. K. Pujari	Universities Press Pvt. Ltd	2016, 1st Edition
3	Data Warehouse life cycle tool kit	Kimball R, Reeves L, Ross M	John Wiley	1998, 1st Edition

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B.C.A
Course Code: 05CA621-B
Course Title: Data Warehouse and Mining

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Computer knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help o AI and Data Science Technologies.
CO 1: Students should be familiar with various characteristics of the data warehouse.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: Learn how data can be stored in data warehouse into its specified architecture.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Understand data mining from basic to advance, including various useful tools and techniques.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Implement data classification and clustering using various algorithms.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Implement advance mining techniques with association rules.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Students should be familiar with various characteristics of the Data warehouse.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 Data Warehouse Basic 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Learn how data can be stored in data warehouse into its specified Architecture.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Storage and Architecture of Data Warehouse 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO3: Understand data mining from basic to advance, including various useful tools and techniques.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Data Mining Basic 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Implement data classification and clustering using various Algorithms.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Classification and Clustering 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Implement advance mining Techniques with association rules.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 Association Rules 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.C.A(Bachelor of Computer Application) Program

Semester-VI

Course Code: 05CA622-A

Course Title: Computer graphics

Pre- requisite: Basic Mathematics and Multimedia

Rationale: The aim of the course is to introduce to the field of ComputerGraphics with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach. It explores the essential theory behind methodologies for developing systems that demonstrate graphical behavior.

Course Outcomes:

05CA622-A .1: Demonstrate knowledge of the fundamental principles of Computer raphics.
05CA622-A.2: Apply scan Conversion algorithms.
05CA622-A.3: Use various filled area primitives.
05CA622-A.4: Familiarize knowledge of clipping.
05CA622-A.5: Comprehend the use of animation.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
DSE-3	05CA622-A	Computer graphics	4	0	1	1	6	4

Legend:
CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop ,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous

guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment: Theory

Board of Study	Course	Course Title	**Scheme of Assessment (Marks)**							
			Progressive Assessment (PRA)						**End Semester Assessment**	**Total Marks** (PRA+ESA)
			Class/Home Assignment 5number	Class Test 2 (2 best out of 3)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA + CAT+AT)	**(ESA)**	
DSE-3	05CA622-A	Computer Graphics	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

05CA622-A .1: Demonstrate knowledge of the fundamental principles of ComputerGraphics.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the Concept of Computer graphics. **SO1.2** Compare types of display devices. **SO1.3 Compare** types of output device.	.	**Unit-1.Introduction of Computer graphics** 1.1 Introduction to Computer Graphics: 1.2 Application of Computer Graphics, 1.3 Interactive and Passive 1.4 Graphics. 1.5 Graphic Systems: 1.6 Display Processor, 1.7 Cathode Ray Tube (CRT), 1.8 Random Scan vs Raster Scan 1.9 Color CRT Monitors, 1.10 Direct View Storage Tubes, Flat Panel 1.11 Display. Input-Output Devices: 1.12 Input Devices, Trackball, Light Pen Image Scanner, Output Devices, Plotters.	1. Search all display devices 2. Numerical based on display Device.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Numerical based on display devices..
ii. Collect all the information of LED
iii. Questions related to display devices.

05CA622-A .2: Apply scan Conversion algorithms.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the concept of scan conversion. **SO2.2** Use the DDA algorithm in problems **SO2.3** Demonstrate the use of Bresenham's Algorithm.		**Unit-2.0** Scan Conversion a line 2.1. Scan Conversion Definition, 2.2. Scan Converting a Point, 2.3. Scan Converting a Straight Line, DDA Algorithm. 2.4. Conversion Circle: 2.5. Defining a Circle, 2.6. Defining a Circle using Polynomial Method, 2.7. Defining a Circle using Polar Coordinates Method 2.8., Bresenham's Circle Algorithm 2.9., Midpoint Circle Algorithm.Scan 2.10. Converting Ellipse: Scan converting a 2.11. Ellipse, Polynomial,Method, 2.12. Trignometric Method, Midpoint	1. Numericals on DDA algorithm. 2. Numerical based on Bresenham,s algorithm

		Ellipse Algorithm	

SW-1 Suggested Sessional Work (SW):
Assignments:

i. Numerical based on Line.
ii. Numerical based on circle.
Iii . Numerical based on Elipse.

05CA622-A .3: Use various filled area primitives.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the Concept of polygon filling. **SO3.2** Use various filling algorithm. **SO3.3** Apply various Polygon algorithm.		**Unit-3.0** Filled Area Primitives 3.1. : Boundary Fill Algorithm, 3.2. Flood Fill Algorithm 3.3. Scan Line Polygon Fill Algorithm.2D 3.4. Transformations: Introduction of Transformation, 3.5. Translation, 3.6. Scaling, Rotation, 3.7. Reflection, Shearing, 3.8. Matrix Representation, 3.9. Homogeneous Coordinates 3.10. Composite Transformation, Pivot 3.11. Point Rotation.2D-Viewing 3.12. Window, Window to Viewport Co-ordinate Transformation, Zooming,	1. Compare and analyze all area fill algorithm.

SW-1 Suggested Sessional Work (SW):

Assignments:

iv. Numerical based on transformation.
v. Numerical based on composite transformation.
vi. Numerical based on window, viewport.

05CA622-A .4: Familiarize knowledge of clipping.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the concept of clipping. **SO4.2** Use of different clipping algorithms. **SO4.3** Apply different shading techniques.		**Unit-4.0** Clipping Techniques 4.1. Clipping, Point Clipping, Line 4.2. Clipping, Midpoint 4.3. Subdivision Algorithm, 4.4. Text Clipping, Polygon, 4.5. Sutherland Hodgeman 4.6. Polygon Clipping, 4.7. Weiler-Atherton Polygon 4.8. Clipping.Pointing & Positioning: 4.9. Pointing & Positioning Techniques 4.10. Elastic or Rubber Band Techniques, Dragging.Shading 4.11. Introduction of Shading, Constant Intensity 4.12. Shading, Gouraud shading, Phong Shading.	1. Compare and analyze all clipping algorithm.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Questions based on clipping..
ii. Numerical based on clipping.
iii. Questions based on Shading.

05CA622-A .5: Comprehend the use of animation.

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand the concept of Animation. **SO5.2** Demonstrate the use of Animation.		**Unit-5.0 Animation.** 5.1. Animation, 5.2. Application Areas of Animation, 5.3. Animation Functions 5.4. 3D Computer Graphics: Three Dimensional Graphics, 5.5. Three Dimensional Transformations, 5.6. Scaling, Rotation, Rotation about, Arbitrary Axis, 5.7. Inverse Transformations, Reflection, 5.8. Shearing, 5.9. Hidden Surfaces: Hidden Surface Removal, Back Face Removal Algorithm, Z-Buffer Algorithm 5.10. Shearing ,Hidden Surfaces: Hidden S 5.11. urface Removal, Back Face Removal 5.12. Algorithm, Z-Buffer Algorithm	1. Compare and analyze all Hidden Removal techniques.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Different types of hidden removal techniques.
ii. Use of Painter's algorithm.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)		Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
05CA622-A .1: Demonstrate knowledge of the fundamental principles of Computer graphics.	12		02	01	15
05CA622-A .2: Apply scan Conversion algorithms**.**	12		02	01	15
05CA622-A .3: Use various filledarea primitives.	12		02	01	15
05CA622-A .4: Familiarize knowledge of clipping.	12		02	01	15
05CA622-A .5: Comprehend theuse of animation**.**	12		02	01	15
Total Hours	60		10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Introduction to Computer Graphics:	03	02	03	08
CO-2	Scan Conversion	03	01	05	09
CO-3	Filled Area Primitives:	03	07	02	12
CO-4	Clipping Techniques.	03	05	05	13
CO-5	Animation	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to IT Industry
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Computer Graphics C Version	Hearn	Pearson Education India;	2nd edition, 2002.
2	Computer Graphics: Principles and Practice	John Hughes, Andries van Dam, Morgan McGuire, David Sklar, James Foley	Addison-Wesley Professional	3rd Edition 2013
3	Lecture note provided by Dept. of CS&E, AKS University, Satna.			

B. Alternative NPTEL/SWAYAM/MOOC Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Computer graphics	Prof. Samit Bhattacharya	IIT Guwhati

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B.C.A
Course Code: 05CA622-A
Course Title: Computer Graphics

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1 Demonstrate knowledge of the fundamental principles of Computer graphics.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2

CO 2 : Apply scan conversion algorithms	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**3**
CO 3: : Use various filled area primitives.	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO 4: : Familiarize knowledge of clipping	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2**
CO 5: Comprehend the use of animation..	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**	**3**

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Demonstrate knowledge of the fundamental principles of Computer graphics.	SO1.1 SO1.2 SO1.3		Unit-1 Introduction to Computer Graphics 1.1,1.2,1.3,1.4,1.5,1.6,1.7	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2 : Apply scan conversion Algorithms**.**	SO2.1 SO2.2 SO2.3		Unit-2 Scan Conversion 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Use various filled area primitives.	SO3.1 SO3.2 SO3.3		Unit-3 Filled Area Primitives: 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Familiarize knowledge of clipping.	SO4.1 SO4.2 SO4.3		Unit-4 Clipping Techniques. 4.1,4.2,4.3,4.4,4.5,4.6,4.7	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Comprehend the use of Animation**.**	SO5.1 SO5.2		Unit-5 Animation 5.1,5.2,5.3,5.4,5.5,5.6,5.7	

A K S University

Faculty of Engineering and Technology

Department of Computer Application& Information Technology

Curriculum of B.C.A. Program

(Revised as on 01 August 2023)

Semester-VI

Course Code: 05CA622-B

Course Title: Cloud Computing

Pre-requisite: Database Management System

Rationale: Cloud Computing is important because it helps to process and store large amount of data sets on virtual space.

Course Outcomes:

05CA622-B 1: Students should be familiar with various characteristics of the cloud platforms.
05CA622-B 2: Learn how virtual platform works for application execution and storage.
05CA622-B 3: Create relational database and other cloud-based file system.
05CA622-B 4: Understand the privacy issues and security strategies in cloud storage.
05CA622-B 5: Implement real time application over various cloud-based platform.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
DSE-3	05CA622-B	Cloud Computing	4	0	2	1	7	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecturer (L) and Tutorial (T) And others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini projected.),
SL: Self-Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

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Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
DSE-3	05CA62	Cloud Computing	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

05CA622-B 1: Students should be familiar with various characteristics of the cloud platforms.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)

SO1.1 Understanding the characteristics of cloud. **SO1.2** Understanding various components of cloud. **SO1.3** Understanding various models of cloud. **SO1.4** Understanding cloud computing platforms.		**Unit-1.0 Cloud Computing** 1.1 Introduction, Definition, characteristics, 1.2 components, 1.3 Cloud service provider, 1.4 The role of networks in Cloud computing, 1.5 Cloud deployment models- private, public, hybrid, 1.6 Cloud service models, 1.7 Multitenancy, Cloud economics and benefits. 1.8 Cloud computing platforms, 1.9 IaaS: AmazonEC2, S3 Bucket, 1.10 PaaS: Google App Engine, 1.11 Microsoft Azure, 1.12 SaaS: AWS IAM (Identity and Access Management).	1. Learning basic features and components of sheets.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Private, Public and Hybrid Cloud.
2. Amazon EC2, Google App Engine, Microsoft Azure.

b. Mini Project:

Cloud Internet Service Provider (ISP)

c. Other Activities (Specify):

NA

05CA622-B 2: Learn how virtual platform works for application execution and storage.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Understanding Significance and types ofvirtualizations. **SO2.2** Understanding various types of virtual machine. **SO2.3** Understanding basics of hypervisor and its types. **SO2.4** Understanding virtual box and other modern virtual machines.		**Unit-2.0 Virtualization** 2.1 Virtualization concepts, 2.2 Virtual machine, Introduction to Containerization Technology 2.3 Server virtualization, 2.4 Storage virtualization, 2.5 Storage services, 2.6 Network virtualization, 2.7 Service virtualization, 2.8 Virtualization management, 2.9 Virtualization technologies and architectures, 2.10 Measurement and profiling of virtualized applications, 2.11 Hypervisors: KVM, 2.12 Xen,VM ware hypervisors and their features.	1. Learning sheet formatting and its preview.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Types of Virtualizations
2. Types of Hypervisors

b. Mini Project:

Storage virtualization & Network virtualization

c. Other Activities (Specify):

NA

05CA622-B 3: Create relational database and other cloud-based file system.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding various types of cloud file system. **SO3.2** Understanding basics of MapReduce Model. **SO3.4** Understanding parallel computing. **SO3.3** Understanding relational operations with MapReduce model.		**Unit-3.0 Data in cloud computing** 3.1 Relational databases, 3.2 Cloud file systems, GFS and HDFS, 3.3 Big Table, HBase and Dynamo, 3.4 Map Reduce and extensions, 3.5 The Map-Reduce model, 3.6 Parallel computing, 3. 7 Parallel efficiency of Map Reduce, 3.8 Relational operations using 3..9 Map-Reduce, 3.10 Enterprise 3.11 batch processingusing Map Reduce. 12. case studies	Exporting and Importing data and protecting sheets.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. GFS
2. HDFS

b. Mini Project:

MapReduce Model

c. Other Activities (Specify):

NA

05CA622-B 4: Understand the privacy issues and security strategies in cloud storage.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 Understanding security fundamentals in cloud system. **SO4.2** Understanding cloud security architecture. **SO4.3** Understanding trusted cloud computing. **SO4.4** Understanding identity management and access control.		**Unit-4.0 Cloud Security** 4.1 Cloud security fundamentals, 4.2 Vulnerabilityassessment tool for cloud, 4.3 Privacy and Security in cloud. 4.4 Cloud computing security architecture – 4.5 General Issues, Trusted Cloud computing, 4.6 Secure Execution Environments and Communications, 4.7 Micro- architectures; 4.8 Identity Management and Access control, Autonomicsecurity. Security challenges: 4.9 Virtualization security management, Virtual threats, 4.10 VM Security Recommendations, VM - Specific Security techniques, 4.11 Secure Execution Environments and	Learning different types of formula and data validation methods.

		4.12Communications in cloud.	

SW-4 Suggested Sessional Work (SW):

a. Assignments:
1. Privacy and Security in Cloud.
2. Virtualization Security Management.

b. Mini Project:
Identity Management and Access Control

c. Other Activities (Specify):
NA.

05CA622-B 5 Implement real time application over various cloud-based platform.

Approximate Hours

Item	Appx. Hrs.
CI	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1 Understanding implementing real time application over cloud platform. **SO5.2** Understanding Billing and Accounting System. **SO5.3** Understanding loadbalancing in cloud. **SO5.4** Understanding resource Optimization and reconfiguration.		**Unit-5.0 Issues in cloud computing** 5.1 Implementing real time application over cloud platform, 5.2 Issues in Inter-cloud environments, 5.3QOS Issuesin Cloud, 5.4 Monitoring in Cloud. 5.5 Dependability, Data migration, 5.6 Streaming inCloud, 5.7 Load balancing, 5.8 Quality of Service (QoS) monitoring in a Cloud computing environment,	Creating different types of charts.

		5.9 Cloud Middleware, 5.10 Mobile Cloud Computing, 5.11Inter Cloud issue, A grid ofclouds, 5.12 Sky computing, Resource optimization, Resource dynamic reconfiguration,	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Data Migration
2. Resource Optimization

b. Mini Project:

Mobile Cloud Computing

c. Other Activities (Specify):

NA.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI (Laboratory Instruction)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
05CA622-B 1**:** student should be familiar with various Characteristics of the cloud platforms.	12	0	2	1	15
05CA622-B 2: will learn how virtual platform works for application Execution and storage.	12	0	2	1	15
05CA622-B 3: Student will create relational database and other cloud-based filesystem.	12	0	2	1	15

05CA622-B 4: student will understand the privacy issues and Security strategies in cloud storage.	12	0	2	1	15
05CA622-B 5: student will implement real time application over Various cloud-basedplatform.	12	0	2	1	15
Total Hours	60	0	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Students should be familiar with various Characteristics of the cloud platforms.	02	05	01	08
CO2	Learn how virtual platform works for application execution and storage.	02	03	05	10
CO3	Create relational database and other cloud-based file system.	02	03	07	12
CO4	Understand the privacy issues and security strategies in cloud storage.	1	3	6	10
CO5	Implement real time application over various cloud-based platform.	1	05	04	10
Total		08	19	23	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Cloud Computing will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year

1	Enterprise Cloud Computing	Shroff Gautam	Cambridge Publication	2010, 1st Edition
2	Cloud Security	Dr. Kumar	Wiley-India	2012, 2nd Edition
3	Cloud Computing: A Practical Approach	Antohy T Velte	McGraw Hill	2009, 1st Edition

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COs, POs and PSOs Mapping

Program: B.C.A
Course Code: 05CA622-B
Course Title: Cloud Computing

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Computer knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: Students should be familiar with various characteristics of the spreadsheet.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO 2: Learn how to format spreadsheet, and viewing its appearance before printing.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO 3: Importing/Exporting Access Data and Text Files. Securing worksheet and workbook.	2	2	1	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO 4: Calculate values and process data through various formula, and using data validation formula.	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO 5: Visualize data values through various types of charts.	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: Students should be familiar with various characteristics of the cloud platforms.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 Cloud Computing 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: Learn how virtual platform works for application execution and storage.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Virtualization 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: Create relational database and other cloud-based file system.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Data in Cloud Computing 3.1,3.2,3.3,3.4,3.5,3.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 4: Understand the privacy issues and security strategies in cloud storage.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Cloud Security 4.1,4.2,4.3,4.4,4.5,4.6	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Implement real time application over various cloud-based platform.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 Issues in cloud computing 5.1,5.2,5.3,5.4,5.5,5.6	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) **Program**

(Revised as on 01 August 2023)

SEMESTER-VII

Course Code: 06CA651

Course Title: Field Project

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale:

- To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.
- To modify/ improve the existing engineering / professional systems.
- To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.
- To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

06CA651.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
06CA651.2: - The student will be able to implement the project plan and manage the project.
06CA651.3: - The student will be able to present the completed project work.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Project	06CA651	Field Project	0	12	0	0	12	6

INTRODUCTION TO PROJECT WORK

Project work is a very important course in all branches of diploma programmes. It offers following opportunities to students of final semester: -

2. To learn skills and abilities which are otherwise not possible either inclassroom or in structured environment of laboratory such as: -
   - Skill to work in groups or teams,
   - Skill to face real life professional problems and to create reallife solutions for them.
   - Skill to take professional decisions under real life constraints and circumstances,
   - Skill to learn in self-directed way to pursue the specific professional projects (Self Directed Learning)

- Skill to learn from real life self- experiences (l i f e l o n g learning)
- Skill to manage the real- l i f e engineering / professional projects
- Skill to plan and organize the self / group professional work
- skills to apply the engineering management principles in real lifeprofessional projects
- Skill to defend / justify self- real life engineering / professionalwork in front of significant others
- Skill to complete the professional tasks / work keeping in viewsocietal, legal and environmental considerations
- Skill to collect relevant data in real life situations
- Skill to relate engineering / professional knowledge gained in various semesters with real life engineering / professional problems
- Skill to estimate the duration and costs in real life engineering / professional work
- Skill to assess the theoretical feasibility, financial feasibility and time feasibility of real- l i f e engineering / professional tasks.

With an objective to ensure the learning of above skills and abilitiesas well as to earn maximum marks in NBA assessment,

The Course on Project Work consists of five phases: -

	Description of phases	Learn Hrs.
1	Literature / industry's need survey and finalization of topic / title	15Hrs
2	Detailed planning of the project work	
3	Implementing the detailed project plan	60Hrs
4	Managing the project activities	
5	Reporting of the project work output /outcome / prototype	15Hrs
	Total	90 Hrs

General Guidelines for Project Work

- The project topics should be related to concerned branch of engineering / profession, but, should not be the exact content of the curriculum taughtin the discipline.
- Student's project topics should be preferably 'real life' topics. It means the project topics should have substantial element of uncertainty, complexity and multi-disciplinary-ness which can be coped up by the students. These elements offer opportunities to students to apply engineering/ professional knowledge in real life settings, solve real life problems and to take real life decisions. As a project guide, concerned teacher should ensure these by suitably altering / framing / reframing the statement of topic / title.
- The project topics should be such that students can get opportunity to refer IS codes, Manuals, Handbooks, norms and standards, opportunity to conduct standard tests, and opportunity to operate modern laboratory equipment's following SOPs.
- For student's interest, active participation and ownership in the project work, their self-motivation is necessary. Therefore, students should be actively involved in finalizing the topic of project.
- Students should be asked to conduct a brief review of literature for problems and issues in their engineering / professional areas of interest,where they think they can contribute effectively. The project guide should facilitate them in this regard, through his/her expertise and experience.

Every student group should be asked to propose at least three topics oftheir interest.

- The topics proposed by student project groups should be assessed bythe facilitator-teacher on following three criteria: -
    - **The work on the topic should be theoretically and practically feasible.**
    - **The project work on the topic should be completed within approx. Three and half months.**
    - **Availability of required resources should be certain. Cost of project work should also be bearable.**
- Normally, students' project works should be carried out in small groups (1 to 2 students).
- All faculty members of department should be engaged as project guides. Every faculty member should be project guide of at least one student project group.
- Normally, project guides should be assigned to the students through lottery system and students under each faculty should be asked to formtheir small groups.

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

Course Title: BCA

Course Code: 06CA651

Course Title: Project-III- Field Project/Internship

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	2	3	3	2	3	2	3	1	3	1	3	3	2	3	3	1	2
CO 2: The student will be able to implement the project plan and manage the project.	2	3	3	2	3	2	3	1	3	1	3	3	2	2	2	2	3
CO 3: The student will be able to present the completed project work.	2	2	3	1	3	2	2	1	3	1	3	3	2	3	2	2	2

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	-	-	-	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: The student will be able to implement the project plan and manage the project.	-	-	-	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: The student will be able to present the completed project work.	-	-	-	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

Semester-VII

Course Code: 06RM701

Course Title : Research Methodology

Pre-requisite: Student should have basic knowledge of research and Statistics.

Rationale: This course will help them to select an appropriate research design. With the help of this course, students will be able to take up and implement a research project/ study. The course will also enable them to collect the data, edit it properly and analyze it accordingly.

Course Outcomes:

06RM701.1: Understand research problem formulation.
06RM701.2: Analyze research related information and Follow research ethics
06RM701.3: Understand that today's world is controlled by Computer, Information Technology, buttomorrow world will be ruled by ideas, concept, and creativity.
06RM701.4: Understanding that when IPR would take such important place in growth of Individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering In particular.
06RM701.5: IPR protection incentivizes inventors to invest in R&D, leading to new and improved products, economic growth, and social benefits.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credit (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Research	06RM701	Research Methodology	4	0	2	1	6	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Research	06RM701	Research Methodology	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

06RM701.1: Understand research problem formulation.

Approximate Hours

Item	Appx Hrs
Cl	11
LI	0
SW	2
SL	1
Total	14

Session Outcomes(SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Define a research problem **SO1.2** Explain Characteristics of a good research problem **SO1.3** Explain Scope and objectives of research problem **SO1.4** Discuss data collection **SO1.5** Explain analysis, interpretation .	.	**Unit-1 Introduction to Research** 1.1 Meaning of research problem, 1.2 Sources of research problem 1.3 Criteria Characteristics of a good research problem, 1.4 Errors in selecting a research problem 1.5 Scope of research problem. 1.6 objectives of research problem. 1.7 Approaches of investigation of solutions for research problem 1.8 data collection, 1.9 data analysis, 1.10 data interpretation, 1.11 Necessary instrumentations-1	1. Write a Process of research problem identification

SW-1 Suggested Sessional Work (SW):

a. Assignments:

(i) Discuss about Errors in selecting a research problem

b. Presentation

c. Pictorial representation of different components of computer

06RM701.2: Analyze research related information and Follow research ethics

Approximate Hours

Item	Appx Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand Effective literature studies. SO2.2 To learn different approaches. SO2.3 Explain Plagiarism. SO2.4 Explain research ethics.	.	**Unit-2 : Literature Review** 2.1 Literature review 2.2 How to write literature reviews 2.3 Effective literature studies 2.4 Approaches to literature studies 2.5 Analysis 2.6 References and bibliography 2.7 APA/MLA and other reference styles 2.8 Plagiarism, **2.9 Types of plagiarism** **2.10 Plagiarism tools** 2.11 Research ethics-1 2.12 Research ethics-2	1.Write a Review

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Write the different approaches of analysis?

b. Presentation

c. Pictorial representation of different components of research design?

06RM701.3: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity

Approximate Hours

Item	Appx Hrs
Cl	11
LI	0
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3. 1 To understand Effective technical writing, SO3.2 know the Format of research proposal SO3.3 Develop a Research Proposal SO3.4 know about presentation of research proposal SO3.5 To understand the assessment of research proposal.		**Unit-3: Research Proposal** **3.1 Research Proposal** **3.2 types** 3.3 Effective technical writing-1 3.4 Effective technical writing-2 3.5 How to write report, 3.6 How to write report, research Paper. 3.7 Developing a Research Proposal, 3.8 Format of research proposal 3.9 Write a research proposal 3.10 presentation 3.11 assessment by a review committee	**i. Design a research proposal**

SW-2 Suggested Seasonal Work (SW):

a. Assignments:
   (i) Explain writing a project proposal?
b. Presentation
c. Pictorial representation of different components of computer

06RM701.4: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to bepromoted among students in general & engineering in particular.

Approximate Hours

Item	Appx Hrs
Cl	13
LI	0
SW	2
SL	1
Total	16

Session Out comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1 To Understand Nature of Intellectual Property **SO4.2** To understand Patents, Designs, Trade and Copyright **SO4.3** Explain the process of patenting **SO4.4** To understand the development of technological research **SO4.5** To Understand Procedure for grants of patents, Patenting under PCT.	.	**Unit-4 : Intellectual Property** 4.1 Nature of Intellectual Property. 4.2 Patents, 4.3 Designs, 4.4 Trade and 4.5 Copyright 4.6 Process of Patenting and 4.7 Development technological research 4.8 innovation, 4.9 patenting, 4.10 development. 4.11 International cooperation on Intellectual Property 4.12 Procedure for grants of patents, 4.13 Patenting under PC	i. Prepare a intellectual property proposal ii. Draw a classification diagram of RAID

SW-4 Suggested Seasonal Work (SW):

a. Assignments:

b. (i) Write the process of patent design

c. Presentation

d. Pictorial representation of different steps of patent design.

06RM701.5: IPR protection incentivizes inventors to invest in R&D, leading to new and improved products, economic growth, and social benefits.

Approximate Hours

Item	Appx Hrs
Cl	13
LI	0
SW	2
SL	1
Total	16

Session Outcomes(SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Explain Patent Rights **SO5.2** Discuss Licensing and transfer of technology **SO5.3**Discuss about Patent information and databases **SO5.4** Understand Geographical Indications **SO5.5** Explain new developments in IPR		**Unit5: IPR protection and Developments in IPR** Patent Rights-1 5.1 Patent Rights-2 5.2 Scope of Patent Rights 5.3 Licensing and transfer of technology-1 5.4 information and databases-1 5.5 Geographical Indication 5.6 Administration of Patent System. 5.7 New developments in IPR; 5.8 IPR of Biological Systems, 5.10 IPR of Computer software tc. 5.11 Traditional knowledge 5.12 Case Studies, IPR and IITs	i. Learn about scope of patent rights ii. Learn about IPR

SW-5Suggested Seasonal Work (SW):

a. Assignments:
(i) Explain in detail about geographical indications.

b. Presentation:

c. Other Activities (Specify):
(i) Group discussion of important topics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
06RM701.1 Understand researchproblem formulation	11	2	1	14
06RM701.2 Analyze research related information and Follow researchethics	11	2	1	14
06RM701.3 Understand that today's world is controlled by Computer, Information Technology, buttomorrow world will be ruled by ideas, concept, and creativity.	12	2	1	15
06RM701.4 Understanding that when IPRwould take such important place ingrowth of Individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering In particular.	13	2	1	16
06RM701.5 IPR protection incentivizesinventors to invest in R&D, leading to new and improved products, economic growth, and social benefits.	13	2	1	16
Total Hours	60	10	6	76

A K S University

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Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Unit-1	03	02	03	08
CO-2	Unit-2	03	01	05	09
CO-3	Unit-3	03	07	02	12
CO-4	Unit-4	03	05	05	13
CO-5	Unit-5	03	02	03	08
Total		15	17	18	50

Legend: **R: Remember, U: Understand, A: Apply**

The end of semester assessment for Research Methodology & IPR will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Data center
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Research Methodology	C R Kothari ,Gaurav Garg	New Age International	2023
2	Research Methodology: Concepts And Cases	Deepak Chawla (Author), Neena Sondhi (Author)	Vikas Publishing House	May 2016

B. Alternative NPTEL/SWAYAM/MOOC Course (if any): NA

C. Curriculum Development Team

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2. Dr. Pramod Singh, Associate Professor, Department of Computer Science and Engineering.
3. Ms. Shruti Gupta, Assistant Professor, Department of Computer Science and Engineering.
4. Ms. Pragya Shrivastava, Assistant Professor, Department of Computer Science & Engineering.
5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science & Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: B.C.A.
Course Code: 06RM701
Course Title: Research Methodology

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning				
RC602.1 At the end of this chapter the student will Understand research problem formulation.	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1
RC602.2 At the end of this chapter the student will Analyze research related information and Follow research ethics	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1
RC602.3 At the end of this chapter the student will Understand that today's world	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2
RC602.4 At the end of this chapter the student will know about Intellectual Property Right	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3
RC602.5 at the end of this chapter the student will Understand that IPR protection	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO1** At the end of this chapter the student will Understand research problem formulation.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11	As mentioned above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO2** At the end of this chapter the student will Analyze research related information and Follow research ethics	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 2.1, 2.2, 2.3, 2.4, 2.5,2.6,2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO3** At the end of this chapter the student will Understand that today's world	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO4** At the end of this chapter the student will know about Intellectual Property Right	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12,4.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO5** at the end of this chapter the student will Understand that IPR protection	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit-5 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12,5.13	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

(Revised as on 01 August 2023)

Semester-VII

Course Code: 01CA711

Course Title : Current trends and technology

Pre-requisite: Basic knowledge of HTML, CSS and JAVASCRIPT.

Rationale: Studying this subject will help students develop an understanding of current technologies such as Blockchains, ReactJS, NodeJS, Express, and MongoDB. By learning about these technologies, students will gain insights into how various industries are using them for their products and what the current demand is. As industries are seeking full-stack developers in this era of rapid technological advancement, this study will help students become industry-ready.

Course Outcomes:

01CA711.1: Understand Concepts of Blockchain, basic cryptocurrency, cryptocurrency benefits and Cryptographic use in cryptocurrency.

01CA711.2: Use of JAVAScript knowledge to learn different types of new Frameworks available in a market that are also current industry need.

01CA711.3: Develop client-server connectivity with the use of Node JS and use of Express frameworks.

01CA711.4: Develop algorithms for text processing applications and Dynamic programming Applications.

01CA711.5: Design Web applications using MongoDB database with NodeJS Technology in Backend.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Major	01CA711	Current trends and technology	4	4	1	1	10	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different

instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Majo r	01CA711	Current trends and technolog y	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Major	01CA711	Current trends and technologyy	35	5	5	5	50	50	100

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Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

01CA711.1: Understand Concepts of Block chain, basic cryptocurrency, cryptocurrency benefits, and cryptographic use in cryptocurrency.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning (SL)
SO1.1 Remember basics of Blockchain concepts. **SO1.2** Explain Bitcoin and understanding of smart contracts **SO1.3** Differentiate between public and private Blockchain. **SO1.4** Discuss cryptocurrency andthe permission model of Blockchain. **SO1.5** Name Security Measures in Blockchain.	**LI1.1.** Create a simple block chain in JavaScript. **LI1.2.** Implement the data structure for blocksand the hashing function for blocks. **LI1.3.** Implement a basic cryptocurrency transaction in a blockchain. **LI1.4.** Create a transaction class and include it in your blockchain. **LI1.5.** Implement a basic cryptocurrency transaction in a	**Unit-1.0 : Blockchain Technology** 1.1 Introduction to Block chain, Public Ledgers. 1.2 Bitcoin, Smart Contracts, Block in a Block chain 1.3 Transactions, Distributed Consensus, 1.4 Public vs Private Block chain. 1.5 Understanding Cryptocurrencyto Block chain, 1.6 Permissioned Model of Block chain 1.7 Overview of Security aspects ofBlock chain;	1. Difference between public and private Blockchain 2. Learning of different cryptographic models used in Blockchain

	blockchain. **LI1.6.** Create a transaction class and include it in your blockchain.	BasicCrypto Primitives. 1.8 Cryptographic Hash Function, Properties of a hash function 1.9 Hash pointer and 1.10 Merkle tree. Digital Signature. 1.11 Public Key cryptography 1.12 Basic cryptocurrency	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss Public ledgers.
2. Discuss basic cryptocurrency and its types.
3. Explain cryptographic hash function.

b. Other Activities (Specify):

Seminar and Tutorial

01CA711.2: Use of JavaScript knowledge to learn different types of new Frameworksavailable in market that are also current industry need.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	6
SW	3
SL	2
Total	24

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning (SL)
SO2.1 To Understand the basics of JavaScript and role of JavaScriptin web world. **SO2.2** Recall data typesand variables in JavaScript **SO2.3** Understand and recall JavaScript operators and JavaScript conditional and loop statements	**LI.2.1.** Write a calculator program in JAVASCRIPT. **LI.2.2. LI02.** Write a program using event in **LI.2.3.** JavaS cript. **LI03**. Write a program to	**Unit-2: Introduction to JavaScript** 2.1. Basics of JavaScript 2.2. JavaScript Data Typesand 2.3. Variables, constant 2.4. JavaScript Operators, 2.5. JavaScript statements conditional 2.6. Looping statements 2.7. 2.4 JavaScript Functions 2.8. simple function and	1. Study of applications where JavaScript concepts are used 2.Study of different operators and loop statements

SO2.4 Use of functions in JavaScript. Learning of Arrow functions **SO2.5** Understanding of classes and objects in JavaScript	**LI.2.4.** implement dropdown in webpage using JAVASCRIPT **LI.2.5.** Example of javascript functions **LI.2.6.** Example of classes and object in javascript	2.9. arrow functions 2.10. classes, objects and 2.11. constructers in JavaScript 2.12. Document Object Model (DOM) 2.13. Event Handling in JavaScript	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss JavaScript features and applications in Real world.
2. Explain Event handling in JavaScript.
3. Explain DOM.

b. Other Activities(Specify):

Seminar and Tutorial

01CA711.3: Apply the knowledge of JAVASCRIPT in the ReactJS framework to create front end of dynamic webpages.

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	6
SW	3
SL	2
Total	23

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1. Recall the basics of	LI3.1. Create a	**Unit-3 : ReactJS**	1. Practice

ReactJS **SO3.2.** Differentiate DOM and Virtual DOM **SO3.3.** Illustrate rendering of element **SO3.4.** Explain class component and functional component **SO3.5.** Develop basic applications of React	component called "Fruit List" that receives an array of fruit names as a propand displays them asa list. LI3.2. Create a functional component called "Greeting" that takesa "name" prop and displays a personalized greeting. LI3.3. Refactor the "HelloWorld" component to use React Hooks for state management instead of a class component. LI3.4. Example of event handling LI3.5. Example of keys LI3.6. Example of list	3.1 Introduction to react, features of React JS, Component based programming 3.2 3.2 Virtual DOM, JSX 3.3 Basic program in React JS 3.4 Rendering elements 3.5 Components: class components and 3.6 functional components 3.7 State management, 3.8 Lifecycle methods 3.9 Event handling in React 3.10 Conditional rendering 3.11 List and keys 3.12 Basic form handling in React	Basic programs based on React concept 2. Study of list and keys

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Design a Web page to explain props and state management.
2. Explain list and keys.
3. Explain Form handling in React.

b. Other Activities(Specify):

Seminar and Tutorial

01CA711..4: Develop client-server connectivity with the use of Node JS and use of Express Frameworks.

Approximate Hours

Item	Appx. Hrs.
Cl	11

LI	6
SW	3
SL	2
Total	22

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Recall features of NodeJS and its applicatons **SO4.2** Explain importance of MERN stack. **SO4.3** Create a web page where callbacks and errors handled. **SO4.4** Explore the concept of Modules in NodeJs. **SO4.5** Use of Export and Require in NodeJS.	LI4.1. Write a Node.js program that reads a user's name from the command line and greets them with "Hello, [Name]!" LI4.2. Create a simple Node.js server that listens onport 3000 and responds with "Hello, Server!" when accessed in a web browser. LI4.3. Write a Node.js program that reads and prints the contents of a text file named "sample.txt". LI4.4. Example of callbacks. LI4.5. Example of error handling LI4.6. Example of	**Unit-4: NodeJS** 4.1. Introduction of NodeJS 4.2. installation of NodeJS and 4.3. Features of NodeJS 4.4. Importance of MERN Stack 4.5. Node JS basics: 4.6. understanding the flow of request 4.7. Callbacks and 4.8. error Handling 4.9. Understanding Modules. 4.10. Export and Require Events in NodeJS 4.11. Event emitter class	1. Study different event use in NodeJS 2. Study Event Emitter class and its functions

	event		

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss the advantages and features of NodeJS.
2. Discuss different Modules in NodeJs.
3. Discuss callbacks and error handling.

b. Other Activities (Specify):

Seminar and Tutorial

01CA711.5: Design Web applications using MongoDB database with NodeJSTechnology in Backend.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	6
SW	3
SL	2
Total	24

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1.Recall the basics of Express and its features **SO5.2** Role of sequencing response by routers **SO5.3** Create a Web application based on Rest API **SO5.4** Use of static files and middleware. **SO5.5** Setup of MongoDB And its use in advance web development	LI5.1. Installation andSetup of MongoDB and start the MongoDB server. LI5.2. How can you connect to a MongoDB databaseusing the MongoDB shell? LI5.3. How do you create a new databasein MongoDB? LI5.4. Example of MangoDB queries. LI5.5. Example of rest API LI5.6. How to istall	**Unit 5: Express & MongoDB** 5.1. Basics of Express 5.2. Installation of MongoDB 5.3. Creating Routes and 5.4. Responding. 5.5. Sequencing response By routes. 5.6. A Rest API Example 5.7. 5.5 Static files and middleware 5.8. Mongo DB Introduction 5.9. Set up MangoDB, Install Mongo client 5.10. MongoDB queries 5.11. install mongoose for node JS 5.12. The rest API example to use database	1. Study different types of trees application. 2. Explore computationa l geometry methods

	mangoDB client.		

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss the importance of Express.
2. Explain the different types of APIs used in Web development
3. Write steps to install MongoDB.

b. Other Activities (Specify):

Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
01CA711.1: Understand Blockchain concepts, basic cryptocurrency, cryptocurrency benefits and cryptographic use in cryptocurrency.	12	6	3	2	23
01CA711.2: Use of JAVAScript knowledge to learn different types of new Frameworks available in market that are also current industry need.	13	6	3	2	24
01CA711.3: Apply th01CA711.e knowledge of JAVASCRIPT in ReactJS framework to create front end of dynamic webpages.	12	6	3	2	23
01CA711.4: Develop client server connectivity with the use of Node JS and use of Express frameworks.	11	6	3	2	22
01CA711.5: Design Web applications using MongoDB database with NodeJS Technology in Backend.	12	6	3	2	23

Total Hours	60	30	15	10	115

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Blockchain Technology	4	3	3	10
CO2	Introduction to JavaScript	3	4	3	10
CO3	ReactJS	3	3	4	10
CO4	NodeJS	2	3	5	10
CO5	Express & MongoDB	-	3	7	10
Total		12	16	22	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Current trends & Technology will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	The Road to Learn React: Your journey to master plain yet pragmatic React.js	By Robin Wieruch.		Kindle edition & 2018
2	Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js,	by Shama Hoque		2nd Edition
3	Melanie Swan, "Block Chain: Blueprint for a	O'Reilly	National Council for Cement and	2015

	New Economy".		Building Materials	

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. C.A.
Course Code: 01CA711
Course Title: Current Trends & Technology

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning				
01CA711.1: Understand Concepts of Blockchain, basic cryptocurrency, cryptocurrency benefits and cryptographic use in cryptocurrency.	1	1	2	2	3	2	3	1	2	1	3	2	2	3	1	2
01CA711.1.2: Use of JAVAScript knowledge to learn different types of new Frameworks available in market that are also current industry need	2	1	2	2	1	2	3	1	1	1	2	2	2	2	2	2
01CA711.3: Apply the knowledge of JAVASCRIPT in ReactJS framework to create front end of dynamic webpages.	2	2	1	1	1	2	2	1	1	2	3	3	1	1	2	2
01CA711.4: Develop client server connectivity with the use of Node JS and use of Express frameworks.	3	2	2	2	3	2	3	1	2	1	3	3	2	3	1	2
01CA711.5: Design Web applications using MongoDB database with NodeJS Technology in Backend.	2	2	2	1	1	3	3	1	1	1	2	2	2	3	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	Laboratory Instruction(LI)	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO1: Understand Concepts of Blockchain, basic cryptocurrency, cryptocurrency benefits and cryptographic use in cryptocurrency.	LI01.1,LI01. 2,LI01.3	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Block chain Technology 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.1 1,1.12	As mentioned above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO2: Use of JAVA Script knowledge to learn different types of new Frameworks available in market that are also current industry need	LI02.1,LI02. 2,LI02.3	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Introduction to JavaScript 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO3: Apply the knowledge of JAVASCRIPT in ReactJS framework to create front end of dynamic webpages.	LI03.1,LI03 .2,LI31.3	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** ReactJS 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11, 3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO4: Develop client server connectivity with the use of Node JS and use of Express frameworks.	LI04.1,LI04. 2,LI04.3	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: NodeJS 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.1 1,	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO5: Design Web applications using MongoDB database with NodeJS Technology in Backend.	LI05.1,LI05. 2,LI05.3	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5: Express & MongoDB 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5. 11,5.12	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

(Revised as on 01 August 2023)

Semester-VII

Course Code: 05CA721-A

Course Title : Theory of computation

Pre-requisite: Basic knowledge of set theory and its properties.

Rationale: Students will understand fundamental mathematical and computational principles that are foundations of computer science. They should learn about abstract models of computation, finite representations for languages and gain formal understanding of algorithms and procedures

Course Outcomes:

05CA721-A**.1:** Understand models and abstractions: automata as a basic model of computation.
05CA721-A**.2:** Students will acquire to represent regular expression and Finite State Automata.
05CA721-A**.3:** Students will acquire to represent CFL and Pushdown Automata.
05CA721-A**.4:** Students will recall Turing machines and the concept of computability, including Decidability and un-decidability.
05CA721-A**.5:** Students will Link between languages, automata, and decision problems.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
DSE-4	05CA721-A	Theory of Computation	4	0	1	1	6	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback

Teachers ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
DSE-4	05CA7 21-A	Theory of Computation	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

05CA721-A.1: Understand models and abstractions: automata as a basic model of computation.

Approximate Hours

Item	Appx. Hrs.
Cl	13
LI	0
SW	1
SL	1
Total	15

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

(Revised as on 01 August 2023)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1. Recall the concepts of alphabet strings and languages **SO1.2.** Recognize the automata and its types **SO1.3.** Identify formal languages **SO1.4.** Derive Inductive proofs **SO1.5.** Differentiate NFA and DFA		**Unit-1** **Introduction to Computational Science** 1.1 Definition of Alphabet, String, Language 1.2 Introduction to formal proof 1.3 Introduction to formal proofs continues 1.4 Additional forms of proof, Inductive proofs 1.5 Chomsky Hierarchy for Formal Languages and Automata 1.6 Finite Automata and its Type 1.7 Deterministic Finite Automata(DFA) 1.8 Deterministic Finite Automata(NFA) 1.9 Epsilon – NFA 1.10 Conversion of NFA to DFA 1.11 Conversion of NFA to DFA practice problems 1.12 Conversion Epsilon NFA to NFA 1.13 Conversion Epsilon	1. Study of Set Theory Basics and properties 2. Practice questions on FA.

		NFA to NFA Examples	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Explain Chomsky Hierarchy with example.
2. Practice question of DFA and NFA.
3. Differentiate among NFA, DFA and epsilon NFA

b. Other Activities (Specify):

Seminar and Tutorial

05CA721-A.2: Student will acquire to represent regular expression and Finite State Automata.

Approximate Hours

Item	Appx. Hrs.
Cl	11
LI	00
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1. Discuss minimization of Finite automata **SO2.2.** Acquire knowledge of Regular expression and Identities. **SO2.3.** List closure properties of Regular Languages. **SO2.4.** Convert Regular expression to FA and vice versa **SO2.5**. Use of Pumping Lemma to prove language is not Regular		**Unit-2 Regular Expression** 2.1 Minimization of DFA: Equivalence class 2.2 Myhill Nerode Minimization. 2.3 Myhill Nerode Minimization Practice problem 2.4 Regular Expression: Rules and Identities 2.5 Simplification of Regular Expression Using Identities	1. Study of different minimization techniques. 2. Applications of Finite automata and Regular expression.

		2.6 Regular Expression to FA 2.7 FA to Regular Expression Transformation 2.8 Arden's Theorem 2.9 Closure properties of Regular language 2.10 Pumping Lemma for Regular Language 2.11 Pumping Lemma for Regular Language Practice problem	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss Pumping Lemma with an example.
2. Discuss Minimization Techniques.
3. Explain closure properties of Regular languages.

b. Other Activities(Specify):

Seminar and Tutorial

05CA721-A.3: Students will acquire to represent CFL and Pushdown Automata.

Approximate Hours

Item	Appx. Hrs.
Cl	14
LI	0
SW	1
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1. Design PDA for CFL. **SO3.2.** Differentiate DPDA and NPDA. **SO3.3.** Derive Parse Tress and identify Ambiguity in Grammar. **SO3.4.** Use of Pumping Lemma to prove language is not Context Free. **SO3.5.** Equivalence of CFG to PDA and PDA to CFG.		**Unit-3 : Context free Grammar** 3.1 Introduction Context free Grammar 3.2 Parse Trees: Let Most Derivation and Right Most Derivation 3.3 Ambiguities in Context-Free Grammar 3.4 Examples of Ambiguity of Grammar 3.5 Simplification of Grammars 3.6 Removal of Null Production 3.7 Removal of Unit Productions, Removal of Useless Symbols 3.8 Definition of the Pushdown automata 3.9 Languages accepted by Pushdown Automata 3.10 String/Language Acceptability by PDA 3.11 Comparison between Non- Non-deterministic PDA and Deterministic PDA 3.12 Equivalence of CFG to PDA 3.13 Equivalence of PDA To CFG 3.14 Pumping Lemma for CFL	1. Design PDA for different languages. 2.Applications of Derivation trees.

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Design PDA for CFLs.
2. Convert CFG to PDA.
3. Differentiate DPDA and NPDA

b. Other Activities(Specify):

Seminar and Tutorial

05CA721-A.4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.

Approximate Hours

Item	Appx. Hrs.
Cl	10
LI	0
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1. Design LBA for the Languages **SO4.2.** Design Turing Machine for Languages **SO4.3.** Discuss Types of Turing Machine **SO4.4.** Recognize Decidability and Undesirability and Halting problem of Turing Machine. **SO4.5.** Recall concept of Universal Turing Machine.		**Unit-4 : Linear Bounded Automata and Turing Machine** 4.1 Normal forms for CFG 4.2 CNF and GNF 4.3 Examples on CNF 4.4 Examples on GNF 4.5 Closure Properties of CFL 4.6 Introduction to Turing Machines 4.7 Examples on Turing Machine 4.8 Universal Turing Machine 4.9 Programming Techniques for TM 4.10 Programming Techniques for TM continues	1. Study different Types of Turing Machine 2. Study of different problems which are undecidable

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Discuss CNF with example
2. Discuss different modifications in Turing machine
3. Explain Universal Turing Machine

b. Other Activities(Specify):

Seminar and Tutorial

05CA721-A.5: **Students will Link between languages, automata, and decision problems.**

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO5.1. Recall Halting problem of Turing Machine. **SO5.2.** Differentiate Recursive and Recursively Enumerable Language. **SO5.3.** Identify P class and NP Class Problem. **SO5.4.** Explain post correspondence problem **SO5.5.** Recognize decidable problems and		**Unit 5: Decidability** 5.1 Halting problem of Turing Machine 5.2 Halting Turing Machine 5.3 Recursive languages 5.4 Recursively enumerable languages 5.5 Differentiate recursive And recursively Enumerable languages 5.6 Decidable problems 5.7 Undecidable Problems	1. Study of P and NP class problems 2. Identify Decidable problems

un- Decidable Problem.		5.8 RE Undecidable problems about Turing Machine 5.9 Post's Correspondence Problem 5.10 P class Problems 5.11 NP class problems 5.12 NP Completeness	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Give some examples to explain P and NP class problems.
2. Identify languages which are Recursive.
3. Explain Halting problem in Turing Machine.

b. Other Activities(Specify):

Seminar and Tutorial

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
05CA721-A 1: Understand models and abstractions automata as a basic model of computation.	13	1	1	15
05CA721-A 2: Student will acquire to represent regular expression and Finite State Automata.	11	1	1	13
05CA721-A 3: Students will acquire to represent CFL and Pushdown Automata.	14	1	1	16

05CA721-A 4: Student willrecall Turing machines and the1concept of computability, including decidability and un-decidability.	10	1	1	12
05CA721-A 5: Students willLink between languages, automata, and decision problems.	12	1	1	14
Total Hours	60	5	5	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
05CA721-A.1	Introduction to Computational Science	05	02	02	09
05CA721-A.2	Regular Expression	02	03	05	10
05CA721-A.3	Context-free Grammars	02	03	06	11
05CA721-A.4	Linear Bounded Automata and Turing Machine	2	03	05	10
05CA721-A.5	Decidability	-	05	05	10
Total		11	16	23	50

Legend: R: Remember, U: Understand, A: Apply

The end-of-semester assessment for Theory of Computation will be held with written examination of 50 marks.

Suggested Learning Resources:

a. Books:

S. No.	Title	Author	Publisher	Edition &Year
1	An Introduction to Formal Languages and Automata	Peter Linz	Jones & Bertlet	Sixth edition
2	Introduction to Automata Theory, Languages and Computation	Hopcroft and Ullman	Pearson	Third Edition
3	Theory of Computer Science: Automata, Languages and Computation	Mishra K.L.P	PHI	Third Edition, 2006

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5. Mr. Lokendra Gaur, Assistant Professor, Department of Computer Science and Engineering.
6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Program: BCA
Course Code: 05CA721-A
Course Title: Theory of Computation

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning				
CO 1: Understand models and abstractions: automata as a basic model of computation.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**
CO 2: Student will acquire to represent regular expression and Finite State Automata.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**
CO 3: Student will acquire to represent CFL and Pushdown Automata.	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**
CO 4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**
CO 5: Students will Link between languages, automata, and decision problems.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 1: Understand models and abstractions: automata as a basic model of computation.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction to Computational Science 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13	As mentioned in Above page number
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 2: Student will acquire to represent regular expression and Finite State Automata.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Regular Expression 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 3: Student will acquire to represent CFL and Pushdown Automata.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** Context free Grammar 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11, 3.12,3.13,3.14	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 4: Student will recall Turing machines and the concept of computability, including decidability and un-decidability.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Linear Bounded Automata and Turing Machine 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 5: Students will Link between languages, automata, and decision problems.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Decidability 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

(Revised as on 01 August 2023)

Semester-VII

Course Code: 05CA721-B

Course Title : Compiler Design

Pre- requisite: C/C++/Java programming language. Data structures and algorithms. Automata theory

Rationale: Study of this subject will develop knowledge of compiler design concepts like Parsers, Lexical Analysis, Syntax analysis and semantic analysis. These concepts will help students to understand design of compiles briefly. Students will develop interest to work in new compilers.

Course Outcome:

05CA721-B.1: To understand the role, functionality and structure of program translation andInterpretation in Software Development

05CA721-B.2: To understand the difference between abstraction levels of a high levelLanguage and a Machine language

05CA721-B.3: To understand the role of a sequence of intermediate representations in Lowering the Level of abstractions in the process of language translation.

05CA721-B.4: To get a first-hand experience of a practical application of elegant data structures,Algorithms, and other core CS concepts such as automata theory

05CA721-B.5: To make effective use of tools such as LEX and YACC

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI+T	SW	SL	Total Study Hours (CI+LI+SW+SL+T)	
DSE-4	05CA721-B	Compiler Design	4	0	2	2	8	4

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) And Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback teachers ensure outcome of Learning.

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
DSE-4	05CA7 21-B	Compiler Design	15	20	5	5	5	50	50	100

05CA721-B.1: To understand the role, functionality and structure of program translation and Interpretation in Software development

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	2

Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1 understand the high level language and a low level language **SO1.2** Explain phases of compilation **SO1.3** Discuss cross-compilation **SO1.4** Definition Traversing a DFA for recognizing tokens **SO1.5** Explain Generating a lexical analyzerusing LEX/Flex		**Unit-1 Introduction to Compilers**: 1.1 Comparing abstractions of a high level language and a low level language; 1.2 compilation asa series of steps for lowering 1.3 the abstraction level through stepwise refinement; 1.4 phases of compilation; 1.5 bootstrapping; 1.6 cross-compilation 1.7 The role of lexical analysis; 1.8 Token, lexemes, and token codes; 1.9 Regular Expressions (RE) to represent tokens, 1.10 Deterministic finite automata (DFA), 1.11 Traversing a DFA forrecognizing tokens; 1.12 Generating a lexical analyzer using LEX/Flex.	1.Token, lexemes, and token codes 2.Deterministic finite automata (DFA),

SW-1 Suggested Sessional Work (SW):

a. Assignments:
1. Regular Expressions (RE) to represent tokens
2. Deterministic finite automata(DFA),
3. Traversing a DFA forrecognizing tokens;

b. Other Activities (Specify): Seminar

05CA721-B.2: To understand the difference between abstractions levels of a high levelLanguage and a Machine Language.

Approximate Hours

Item	AppX Hrs
Cl	18
LI	0
SW	2

SL	2
Total	22

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand the Context Free Grammars **SO2.2** To learn Overview of top-down and bottom-up parsing **SO2.3** To lean about viable prefixes and valid items, Constructing LR(0) sets of items **SO2.4** Explain Top-down parsing, Left factoring **SO2.5** Explain parsing, recursive descent parsing		**Unit 2: Syntax Analysis**: 2.1: Context Free Grammars (CFG), 2.2: Concept of parsing, sentences and sentential forms, 2.3: leftmost and rightmost derivations, parse trees, ambiguous grammar 2.4: Overview of top-down and bottom-up parsing; 2.5: Introduction to shift reduce parsing; 2.6: viable prefixes and	1. Generating a parser using a parser generator such as ANTLR 2. leftmost and rightmost derivations, parse trees, ambiguous grammar

		valid items, Constructing LR(0) sets of items; 2.7 : Constructing SLR parsing tables; 2.8 : Generating a parser using a parser generator such as YACC/Bison. 2.9: Top-down parsing, Left factoring, 2.10 : Elimination of left-recursion 2.11 : Practice problems on left recursion removal 2.12 : predictive parsing 2.13 : Examples on predictive parsing 2.14 : recursive descent parsing 2.15 : Examples on recursive descent parsing 2.16 : LL (1) parsing and LL(1) parsing table 2.17: String acceptance using LL(1) parsing 2.18: Generating a parser using a parser generator such as ANTLR, Java CC, etc.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:
   i. viable prefixesand valid items, Constructing LR(0) sets of items;
   ii. Generating a parser using a parser generator such as YACC/Bison
   iii. Generating a parser using a parser generator such as YACC/Bison.

b. Other Activities (Specify):
Seminar

05CA721-B.3: To understand the role of a sequence of intermediate representations in lowering theLevel of Abstractions in the process of language translation

.

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	2
Total	16

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO3.1 To Understand semantic analysis **SO3.2** To learn assignment Statements **SO3.3** To understand the attribute evaluation **SO3.4** Explain Applications of SDTS **SO3.5** learn about declaration processing andtype checking	1. Write a parser to parse the given input MMC program 2. Write a C Program to implement DFAs that recognize identifiers, constants, and operators of the mini language	**Unit3: Semantic Analysis:** 3.1 The need of semantic analysis 3.2 abstract syntax treesfor expressions, 3.3 assignment Statements 3.4 Examples on assignment Statements 3.5 control flow statements 3.6 attribute evaluation, 3.7 syntax directed translation schemes (STDS); 3.8 Applications of SDTS 3.9 Examples the SDTS 3.10 declaration processing andtype checking, 3.11 generating three-address Code 3.12 Examples on declaration processing	1. abstract syntax treesfor expressions 2. Assignment Statements and control flow statements;

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Applications of SDTS
2. Declaration processing andtype checking

3. Generating three-addresscode

b. Other Activities (Specify):

Seminar

05CA721-B 4: To get a first-hand experience of a practical application of elegant data structures, Algorithms, and other core CS concepts such as automata theory

Approximate Hours

Item	AppX Hrs
Cl	10
LI	0
SW	2
SL	2
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO4.1 Evaluation Parameter passing by value **SO4.2** Understanding the stack and static allocation of activation records **SO4.3** To learn translating a functioncall **SO4.4** To lean about function epilogue **SO4.**5 Discuss call sequence, and return sequence	1. Write a type-checker for a syntactically correct input MMC program 2. Implement the lexical analyzer using Lex, flex or other lexical analyzer-generating tools.	**Unit-4 : Run time support**: 4.1 Parameter passing by value, 4.2 reference, and name 4.3 activation records 4.4 stack and static 4.5 allocation of activation records 4.6 translating a functioncall 4.7 allocating offsets to variables, 4.8 generating code forfunction prologue, 4.9 function epilogue, 4.10 call sequence, and return sequence.	1. stack and static allocation of activation records 2. generating code forfunction prologue

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Stack and static allocation of activation records;
2. Generating code for function prologue
3. Call sequence, and return sequence

b. Other Activities (Specify):
Seminar

05CA721-B 5: To make effective use of tools such as LEX and YACC.

Approximate Hours

Item	AppX Hrs
Cl	8
LI	0
SW	2
SL	2
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 To Understand Control flow graphs **SO5.2** Explain Local optimizations **SO5.3** learn this subexpression **SO5.4** To understand assembly codefrom **SO5.5** Explain allocation and instruction selection		**Unit 5: Introduction to Code:** 5.1 Optimization 5.2 Control flow graphs 5.3 Localoptimizations (common subexpression),copy propagation, 5.4 dead code elimination 5.5 Generating assembly 5.6 codefrom three address codes 5.7 using simple register 5.8 allocation and instruction selection.	1. copy propagation 2. dead code elimination

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Local optimizations (common subexpression, copy propagation, dead code elimination)
2. Generating assembly code from three address codes
3. Allocation and instruction selection

b. Other Activities (Specify):
Seminar

Brief of Hours suggested for the Course Outcome

Course Outcomes	**Class Lecture (Cl)**	**Sessional Work (SW)**	**Self-Learning (Sl)**	**Total hour (Cl+SW+Sl +LI)**

05CA721-B.1: To understand the role, functionality and structure of program translation and interpretationin software development.	12	02	02	16
05CA721-B.2 To understand the difference between abstraction levelsof a high-level language and a machine language	18	02	02	22
05CA721-B.3: To understand the role of a sequence of intermediate representations in lowering the level of abstractions in the processof language translation	12	02	02	16
05CA721-B.4: To get a first-hand experience of a practical application of elegant data structures, algorithms, and other core CS concepts such as automata theory	10	02	02	14
05CA721-B.5: To make effective use of tools suchas LEX and YACC.	08	02	02	12
Total Hours	60	10	10	80

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	**Introduction to Compilers**	03	02	03	08

CO-2	**Syntax Analysis**	03	01	05	09
CO-3	**Semantic Analysis**	03	07	02	12
CO-4	**Run time support**	03	05	05	13
CO-5	**Introduction to Code**	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Compiler Design will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S.No.	Title	Author	Publisher	Edition & Year

1	Compilers	Aho, Lam, Sethi, and Ullman	Principles, Techniques, and Tools	2/e, Addison-Wesley, 2006
2	Modern Compiler Implementation in Java	Andrew Appel and Jens Palsberg	Pearson Education India	2/e, Cambridge University Press, 2002.

Curriculum Development Team

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COs, POs and PSOs Mapping

Program: B. C.A.
Course Code: 05CA721-B
Course Title: Compiler Design

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning				
CO1: To understand the role, functionality, and structure of program translation and interpretation in software development.	2	3	3	2	1	2	1	1	1	1	1	2	**2**	**3**	**1**	**2**
CO2:To understand the difference between abstraction levels of a high-level language and a machine language	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**2**	**2**	**2**
CO3: To understand the role of a sequence of intermediate representations in lowering the level of abstractions in the process of language translation	2	3	3	2	1	1	1	1	1	1	1	3	**1**	**1**	**2**	**2**
CO4: To get a first-hand experience of a practical application of elegant data structures, algorithms, and other core CS concepts such as automata theory	2	2	3	3	1	2	1	1	1	1	1	3	**2**	**3**	**1**	**2**
CO5: To make effective use of tools such as LEX and YACC.	2	3	3	3	2	2	1	1	1	1	3	3	**2**	**3**	**1**	**1**

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 1: To understand the role, functionality, and structure of program translation and interpretation in software development.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 : Introduction to Compilers 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12,13,14,15,16,17,18 PSO 1,2, 3, 4	CO 2:To understand the difference between abstraction levels of a high-level language and a machine language	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Unit-2 : Syntax Analysis 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12,2.13,2.14,2.15, 2.16,2.17,2.18	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 3: To understand the role of a sequence of intermediate representations in lowering the level of abstractions in the process of language translation	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Unit-3 **:** Semantic Analysis 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11, 3.12	
PO 1,2,3,4,5,6,7, 8,9,10 PSO 1,2, 3, 4	CO 4: To get a first-hand experience of a practical application of elegant data structures, algorithms, and another core CS concepts such as automata theory	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4: Run Time support 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10	
PO 1,2,3,4,5,6,7, 8 PSO 1,2, 3, 4	CO 5: To make effective use of tools such as LEX and YACC.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	Unit-5 : Introduction to code 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8	

A K S University

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Curriculum of B.Tech. (Computer Science & Engineering) **Program**

(Revised as on 01 August 2023)

Semester-VIII

Course Code: 06CA751

Course Title: Field Project

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale: To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.

To modify/ improve the existing engineering / professional systems.

To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.

To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

06CA751.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
06CA751.2: - The student will be able to implement the project plan and manage the project.
06CA751.3: - The student will be able to present the completed project work.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Project	06CA751	Field Project	0	5	0	1	4	6

INTRODUCTION TO PROJECT WORK

Project work is a very important course in all branches of diploma programmes. It offers following opportunities to students of final semester: -

3. To learn skills and abilities which are otherwise not possible either inclassroom or in structured environment of laboratory such as: -
   - Skill to work in groups or teams,
   - Skill to face real life professional problems and to create reallife solutions for them.
   - Skill to take professional decisions under real life constraints and circumstances,
   - Skill to learn in self-directed way to pursue the specific professional projects (Self Directed Learning)
   - Skill to learn from real life self- experiences (l i f e l o n g learning)

- Skill to manage the real-life engineering / professional projects
- Skill to plan and organize the self / group professional work
- skills to apply the engineering management principles in real lifeprofessional projects
- Skill to defend / justify self-real life engineering / professionalwork in front of significant others
- Skill to complete the professional tasks / work keeping in viewsocietal, legal and environmental considerations
- Skill to collect relevant data in real life situations
- Skill to relate engineering / professional knowledge gained in various semesters with real life engineering / professional problems
- Skill to estimate the duration and costs in real life engineering / professional work
- Skill to assess the theoretical feasibility, financial feasibility and time feasibility of real-life engineering / professional tasks.

With an objective to ensure the learning of above skills and abilitiesas well as to earn maximum marks in NBA assessment,

The Course on Project Work consists of five phases: -

	Description of phases	Learn Hrs.
1	Literature / industry's need survey and finalization of topic / title	15Hrs
2	Detailed planning of the project work	
3	Implementing the detailed project plan	60Hrs
4	Managing the project activities	
5	Reporting of the project work output /outcome / prototype	15Hrs
	Total	90 Hrs

General Guidelines for Project Work

- The project topics should be related to concerned branch of engineering / profession, but, should not be the exact content of the curriculum taughtin the discipline.
- Student's project topics should be preferably 'real life' topics. It means the project topics should have substantial element of uncertainty, complexity and multi-disciplinary-ness which can be coped up by the students. These elements offer opportunities to students to apply engineering/ professional knowledge in real life settings, solve real life problems and to take real life decisions. As a project guide, concerned teacher should ensure these by suitably altering / framing / reframing the statement of topic / title.
- The project topics should be such that students can get opportunity to refer IS codes, Manuals, Handbooks, norms and standards, opportunity to conduct standard tests, and opportunity to operate modern laboratory equipment's following SOPs.
- For student's interest, active participation and ownership in the project work, their self-motivation is necessary. Therefore, students should be actively involved in finalizing the topic of project.
- Students should be asked to conduct a brief review of literature for problems and issues in their engineering / professional areas of interest,where they think they can contribute effectively. The project guide should facilitate them in this regard, through his/her expertise and experience.

Every student group should be asked to propose at least three topics oftheir interest.

- The topics proposed by student project groups should be assessed bythe facilitator-teacher on following three criteria: -
    - **The work on the topic should be theoretically and practically feasible.**
    - **The project work on the topic should be completed withinapprox. Three and half months.**
    - **Availability of required resources should be certain. Cost ofproject work should also be bearable.**
- Normally, students' project works should be carried out in small groups (1 to 2 students).
- All faculty members of department should be engaged as project guides. Every faculty member should be project guide of at least one student project group.

- Normally, project guides should be assigned to the students through lottery system and students under each faculty should be asked to formtheir small groups.

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 06CA751
Course Title: Field Project

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	2	3	3	2	3	2	3	1	3	1	3	3	2	3	3	1	2
CO 2: The student will be able to implement the project plan and manage the project.	2	3	3	2	3	2	3	1	3	1	3	3	2	2	2	2	3
CO 3: The student will be able to present the completed project work.	2	2	3	1	3	2	2	1	3	1	3	3	2	3	2	2	2

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	-	-	-	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: The student will be able to implement the project plan and manage the project.	-	-	-	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: The student will be able to present the completed project work.	-	-	-	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

Semester VIII

Course Code: 06RM801

Course Title: English for Research Paper Writing

Pre- requisite: Students should have basic knowledge of presenting themselves, their thoughts and ideas

Rationale: Writing a research paper is the primary channel for passing on knowledge to the scientist working in the same field or related fields. It is important to know the skill of writing papers to demonstrate your ability to understand, relate to what has been learnt, as well as receive critical peer feedback.

06RM801 1: Student will learn how to improve their writing skills, and level of readability
06RM801 2: Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness
06RM801 3: Students will learn about what to write in each section of paper
06RM801 4: Students will understand significance of each section of paper, and learn how to write it at thesame time.
06RM801 5: Ensure the good quality of paper at very first-time submission

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Research	06RM801	English for Research Paper Writing	4	0	2	1	7	4

Legend:
CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)	**(ESA)**	(PRA + ESA)
Research	06RM801	English for Research Paper Writing	15	20	5	5	5	50	50	100

Course-Curriculum Detailing

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

06RM801 1: Student will learn how to improve their writing skills, and level of readability

Approximate Hours

Item	Appx Hrs.
Cl	12
LI	0

SW	1
SL	1
Total	14

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**
SO1.1 Students learn to design the research paper. SO1.2 Students learn to read the research paper in a systematic way. SO1.3 Examine and identify the redundancy in a research paper SO1.4 Learn to summarise and be concise SO1.5 Understand the concept of ambiguity and vagueness		Unit 1: Preparation of Research Paper 1.1 Steps to introduce to the technique of reading research paper 1.2 Steps to introduce to the technique of reading research paper continued 1.3 Breaking up of sentences, 1.4 Breaking up of sentences continued 1.5 structuring paragraphs 1.6 structuring paragraphs continued 1.7 Making the paper concise 1.8 Making the paper concise continued 1.9 removing redundancy 1.10 removing redundancy Continued 1.11 Concept of Ambiguity and 1.12 Concept of Vagueness	Reading research papers on relevant topics

06RM801 2: Students will understand the concept of plagiarism, and how to avoid ambiguity andvagueness

Approximate Hours

Item	Appx Hours
Cl	12
LI	0

SW	1
SL	1
Total	14

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**Self - Learning (SL)**
SO2.1: Students learn to create a contrast between previous and present work. SO2.2: Learn paraphrasing tool SO2.3: Use of plagiarism check tool SO2.4: Students understand the concept of hedging and criticising	.	UNIT 2 – Paraphrasing and checking Plagiarism 2.1. Clarifying Who Did What, 2.2. Highlighting Your Findings, 2.3. Hedging and 2.4. Criticising, 2.5. Paraphrasing 2.6. Plagiarism 2.7. Clarification of previous work and their order 2.8. Highlighting your work 2.9. Paraphrasing and 2.10. its tools 2.11. Plagiarism Check Software 2.12. Use of Plagiarism Check Software	Learn different AI tools for Writing

06RM801 3: Students will learn about what to write in each section of paper

Approximate Hours

Item	Appx Hours
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**

SO3.1**:** Students learn to write a research paper in proper format. SO3.2: Students are able to understand different sections of paper. SO3.3: Create an effective abstract and introduction. SO3.4**:** Describe Review of Literature. SO3.5: Learn to write Methodology of Research Paper.	.	Unit-3**:**Planning Sections of a Paper 3.1.Introduction to sections of a research paper. 3.2.Introduction to sections of a research paper continued 3.3.Key skills to write an Abstract and 3.4.Key skills to write an Introduction. 3.5.Skills to write Review of Literature. 3.6.Skills to write Review of Literature continued 3.7.Key skills to write Methodology. -I 3.8.Key skills to write Methodology. -II 3.9.Skills to draw diagrams 3.10. Skills to draw diagrams continued 3.11. Key skills to plot result graphs 3.12. Key skills to write future scope	Study key skills to write the abstract and Methodology

06RM801 4: Students will understand significance of each section of paper, and learn how to writeit at the same time.

Approximate Hours

Item	Appx Hours
Cl	9
LI	0
SW	0
SL	1
Total	10

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**

SO4.1: Students learn to state the result of their findings. SO4.2: Students learn to draw conclusions of their research SO4.3: Students are able to analyse and discuss their result of paper SO4.4: Students are able to evaluate their paper SO4.5: Students learn to assess their work through a final check.	.	Unit-4 : Finalising the Research Paper 4.1 Results of research findings-I 4.2 Results of research findings-II 4.3 Drawing conclusion of the research-I 4.4 Drawing conclusion of the research-II 4.5 Discussion on the result of paper-I 4.6 Discussion on the result of paper-II 4.7 Final check of the paper-I 4.8 Final check of the paper-II 4.9 Discussion of future scope	Study of to find research gaps

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06RM801 5: Ensure the good quality of paper at very first-time submission

Item	Appx Hours
Cl	12
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**
SO5.1: Students are able to understand effective research paper writing skills		Unit 5- Research Paper Publication 5.1. Useful Phrases for effective research paper writing-I 5.2. Useful Phrases for effective research paper writing-II	Study of different journals

		5.3. Useful Phrases for effective research paper writing-III 5.4. Selection of appropriate journal 5.5. Selection of appropriate journal 5.6. Identify Predatory journal 5.7. Identify Predatory journal 5.8. Check submission format of research papers 5.9. Check submission format of research papers 5.10. Paper submission techniques-I 5.11. Paper submission techniques-II 5.12. Paper submission techniques-III	

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
06RM801 1: Student will learn how to improve theirwriting skills, and level of readability	12	1	1	10
06RM801 2: Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness	12		1	10
06RM801 3: Students will learn about what to writein each section of paper	12		1	10
06RM801 4: Students will understand significance of each section of paper, and learn how to write itat the same time.	12		1	9
06RM801 5: Ensure the good quality of paper at veryfirst-time submission.	12		1	10
Total Hours	60	1	04	49

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

Suggestion for End Semester Assessment 1

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
1	Unit 1: Preparation of Research Paper	2	5	3	10
2	Unit 2: Paraphrasing and checking Plagiarism	3	4	3	10
3	Unit 3: Planning Sections of a Paper	2	3	5	10
4	Unit 4: Finalising the Research Paper	2	2	6	10
5	Unit 5: Research Paper Publication	1	2	7	10
Total		10	16	24	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for English for Research Paper Writing s will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Brainstorming

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

COs, POs and PSOs Mapping

Program: B.C.A.
Course Code: 06RM801
Course Title: English for research paper writing

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning				
CO 1: : Student will learn how to improve their writing skills, and level of readability	2	2	1	1	3	2	2	3	2	2	1	1	2	3	3	1
CO 2 : Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness	2	2	2	1	3	2	2	3	2	2	2	1	2	2	2	1
CO 3: Students will learn about what to write in each section of paper	2	3	2	1	3	2	2	3	2	3	2	1	1	1	2	2
CO 4: Students will understand significance of each section of paper, and learn how to write it at the same time	1	-	2	1	1	1	-	-	1	-	2	1	3	3	3	2
CO 5: Ensure the good quality of paper at very first-time submission	1	2	2	1	2	2	1	3	1	2	2	1	3	3	1	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 1: Student will learn how to improve their writing skills, and level of readability	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-1 Self-grooming, Basic Etiquettes andPresentation Skill 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in page number above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 2 : Students will understand the concept of plagiarism, and how to avoid ambiguity and vagueness	SO2.1 SO2.2 SO2.3 SO2.4	Unit-2 Confidence building skills, InterviewSkills and Resume Writing 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 3: Students will learn about what to write in each section of paper	SO3.1 SO3.2 SO3.3 SO3.4 So3.5	Unit-3 Public Speaking Skills& Conversational Skills 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 4: Students will understand significance of each section of paper, and learn how to write it at the same time	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	Unit-4 Functional Grammar and Vocabulary Building 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	CO 5: Ensure the good quality of paper at very first-time submission	SO5.1	Unit-5 Indian Writing inEnglish& Hindi Statistics 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

Semester-VIII

Course Code: 01CA811

Course Title : Statistical Thinking for Data Science

Pre-requisite: Student should have basic knowledge of Statistics and database

Rationale: Statistical Thinking for Data Science boosts the discovery of new and unexpected insights From data.

Course Outcomes:

01CA811.1: Understand the statistical foundation for data science

01CA811.2: Apply statistical thinking in collecting, modeling and analyzing data

01CA811.3: Apply statistical thinking in collecting, modeling and analyzing data

01CA811.4: Ability to visualize all types of data

01CA811.5: Understand how to use R for different types of data

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Major	01CA811	Statistical Thinking for Data Science	4	4	2	1	11	6

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performance laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Major	01CA811	Statistical Thinking for Data Science	15	20	5	5	5	50	50	100

Scheme of Assessment: Practical

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Viva1 (5)	Viva2 (5) (SA)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Major	01CA811	Statistical Thinking for Data Science	35	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

01CA811..1: Understand the statistical foundation for data science

Approximate Hours

Item	Appx. Hrs.
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Define Data acquisition **SO1.2** Explain cleaning and aggregation **SO1.3** Explain Exploratory data analysis **SO1.4** Discuss data Visualization **SO1.5** Model creation and validation .	**LI1.1.** Calculate the mean, for a given dataset. **LI1.2.** Calculate the median for a given dataset. **LI1.3.** Calculate the mode for a given dataset. **LI1.4.** Determine the standard deviation and variance of a set ofdata points. **LI1.5.** Create a histogram and interpret the distribution of a dataset. **LI1.6.** Example of aggregation	**Unit 1: Introduction to Data Science: (9 lecture)** 1.1 Data acquisition-I 1.2 Data acquisition-II 1.3 Cleaning-I 1.4 Cleaning-II 1.5 Aggregation-I 1.6 Aggregation-II 1.7 Exploratory data analysis-I 1.8 Exploratory data analysis-II 1.9 Visualization 1.10 Feature engineering 1.11 Model creation and 1.12 validation	1. Learn Feature engineering

SW-1 Suggested Sessional Work (SW):

a. Assignments:

(i) Discuss about different techniques of data analysis

b. Presentation

01CA811.2: Apply statistical thinking in collecting, modeling and analyzing data

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12

SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO2.1 To Understand StatisticalThinking, **SO2.2** To learn different approaches of data sampling **SO2.3** To Explain Probability **SO2.4** To Explain StatisticalInference	LI2.1. Apply the concept of conditional probability to a real-world scenario. LI2.2. Use the binomial distribution to model a probability scenario. LI2.3. Applythe normal distribution to solve a problem involving z- scores. LI2.4. Example based on probability LI2.5. Example based on statistical inference LI2.6. Example of population to sampled data.	**Unit-2: Statistical Thinking 1(9 lectures)** 2.1 Examples of Statistical Thinking, 2.2 Numerical Data 2.3 Summary Statistics 2.4 From Population to Sampled Data 2.5 Different Types of Biases-I 2.6 Different Types of Biases 2.7 -II 2.8 Introduction to Probability 2.9 Concepts of Probability-I 2.10 Concepts of Probability-II 2.11 Introduction to Statistical Inference 2.12 Concepts of Statistical Inference	1. learn different types of Biases.

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Write about numerical data?

b. Presentation

01CA811.3: Apply statistical thinking in collecting, modeling and analyzing data

Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO3. 1 To understand Association and Dependence SO3.2 know the Conditional Probability and Bays Rule SO3.3 To understand the LinearRegression. SO3.4 develop a Special Regression Model	LI3.1. Compute probabilitiesfor simple events and joint events. LI3.2. Calculate the margin of error and construct a confidence interval. LI3.3. Perform a hypothesis test and interpret the results. LI3.4. Explain the difference between association and causation using an example from a real-world dataset. LI3.5. Provide a step-by-step solution to a Bayes' Rule problem using a dataset related to spam email classification. LI3.6. Calculate the conditional probability of an event A given event B has occurred using a dataset.	**Unit3:Statistical Thinking 2 (9 lecture)** 3.1 Association and Dependence 3.2 Association and Causation 3.3 Conditional Probability-I 3.4 Conditional Probability-II 3.5 Bays Rule 3.6 Example of Bays Rule 3.7 Simpsons Paradox 3.8 Example 3.9 Confounding 3.10 Introduction to Linear Regression 3.11 Questions based on linear regression 3.12 Special Regression Model.	I. Learn about Simpsons Paradox

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain Association and Causation

b. Presentation

01CA811.4: Ability to visualize all types of data

Approximate Hours

Item	App X Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Out comes (SOs)	**Laboratory Instruction(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO4.1 To Understand the Goalsof statistical graphics and data visualization **SO4.2** Explain the Graphs ofData **SO4.3** implement Graphs ofFitted Models **SO4.4** To Understand the Principles of graphics	LI4.1. Use autocorrelationand partial autocorrelation functions in time series analysis. LI4.2. ApplyARIMA modeling to make predictions ina time series dataset. LI4.3. Evaluate the accuracy of time series forecasts using appropriate metrics. LI4.4. Create various types of graphs to represent a given dataset. LI4.5. Visualize the fit of a simple linear regression model. LI4.6. Discuss how the principles of Tufte's data visualization theory can be applied to modern data visualizations.	**Unit-4 : Exploratory Data Analysis and Visualization (9 lectures)** 4.1. Goals of statistical graphics and 4.2. data visualization 4.3. Graphs of Data-I 4.4. Graphs of Data-II 4.5. Graphs of Fitted Models-I 4.6. Graphs of Fitted Models 4.7. -II 4.8. Graphs to Check Fitted Models-I 4.9. Graphs to Check Fitted Models-II 4.10. What makes a good graph? 4.11. Principles of graphics.-I 4.12. Principles of graphics.-II	i. Draw a different graphs to fitted models

SW-4 Suggested Seasonal Work (SW):

a. Assignments:

(i) Write the Principles of graphics?

b. Presentation

c. Pictorial representation of different graphs for data visualization.

01CA811.5: Understand how to use R for different types of data

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Approximate Hours

Item	AppX Hrs
Cl	12
LI	12
SW	1
SL	1
Total	26

Session Outcomes (SOs)	**Laboratory Instruction(LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO5.1To Understand Bayesian inference **SO5.2** Discuss combining models anddata in a forecasting problem **SO5.3** To Explain Bayesian hierarchical modeling for studying public opinion **SO5.4** To Understand Bayesian modeling forBig Data	LI5.1. ApplyBayes' Theorem to update probabilities based on newinformation. LI5.2. Identifytrends and seasonality ina time series dataset. LI5.3. Develop aresearch question for adata science project. LI5.4. Compare the results of Bayesian inference with different priors. LI5.5. Use Bayesian modeling to address a forecasting problem. LI5.6. Apply Bayesian methods to analyze public opinion data	**Unit5: Introduction to Bayesian Modeling (8 lectures)** 5.1 Bayesian inference-I 5.2 Bayesian inference-II 5.3 combining models and data 5.4 combining models and data 5.5 forecasting problem 5.6 forecasting problem 5.7 Bayesian hierarchical modeling 5.8 Bayesian hierarchical modeling 5.9 studying public opinion 5.10 studying public opinion 5.11 Bayesian modeling for Big Data 5.12 Bayesian modeling for Big Data	I. Learn forecasting problem

SW-5Suggested Seasonal Work (SW):

a. Assignments:

(i) Explain in detail about Bayesian hierarchical modeling

b. Presentation:

c. Other Activities (Specify): Group discussion of important topics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction(LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
01CA811.1. Understand the statisticalfoundation for data science	12	12	1	1	**26**
01CA811.2 Apply statistical thinkingin collecting, modeling and analyzing data	12	12	1	1	**26**
01CA811.3 Apply statistical thinking in collecting, modeling and analyzing data	12	12	1	1	**26**
01CA811.4 Ability to visualize alltypes of data	12	12	1	1	**26**
01CA811.5 Understand how to use R for different types of data	12	12	1	1	**26**
Total Hours	60	60	5	5	130

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Unit 1: Introduction to Data Science	03	02	03	08
CO-2	Unit-2: Statistical Thinking 1	03	01	05	09
CO-3	Unit3:Statistical Thinking2	03	07	02	12
CO-4	Unit-4 : Exploratory Data Analysis and Visualization	03	05	05	13
CO-5	Unit5: Introduction to Bayesian Modeling	03	02	03	08
Total		15	17	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Statistical Thinking for Data Science will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

A. Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Computational Thinking: A Primer For Programmers And Data Scientists	G Venkatesh	Notion Press	2022
2	Data Science A Beginner's Guide	C. Raju	Penguin Random House	2023

B. Alternative NPTEL/SWAYAM/MOOC Course (if any): NA

Curriculum Development Team

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6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Ms. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.
8. Ms. Pushpa Kushwaha, Assistant Professor, Department of Computer Science and Engineering.

COs, POs and PSOs Mapping

Course Title: BCA
Course Code: 01CA811
Course Title: Statistical Thinking for Data Science

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-longlearning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO1 Understand the statistical foundation for data science	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1	2
CO2 Apply statistical thinking in collecting, modeling and analyzing data	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1	3
CO3 Apply statistical thinking in collecting, modeling and analyzing data	3	2	2	2	3	2	3	2	2	1	2	3	3	3	3	2	2
CO4 Ability to visualize all types of data	-	-	-	1	1	3	3	3	1	1	2	2	3	3	1	3	3
CO5 Understand how to use R for different types of data	2	3	1	1	2	3	-	-	2	-	2	2	3	2	2	3	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO1** Understand the statistical foundation for data science	SO1.1 SO1.2 SO1.3 SO1.4	LI1.1,LI1.2,LI1 .3	**Unit 1: Introduction to Data Science: (9 lecture)** 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12	As mentioned in page number above
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO2** Apply statistical thinking in collecting, modeling and analyzing data	SO2.1 SO2.2 SO2.3 SO2.4	LI2.1,LI2.2,LI2 .3	**Unit-2: Statistical Thinking 1** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7,2.8,2.9,2.10,2.11,2.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO3** Apply statistical thinking in collecting, modeling and analyzing data	SO3.1 SO3.2 SO3.3 SO3.4	LI3.1,LI3.2,LI3 .3	**Unit3:Statistical Thinking2** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO4** Ability to visualize all types of data	SO4.1 SO4.2 SO4.3 SO4.4	LI4.1,LI4.2,LI4 .3	**Unit-4 : Exploratory Data Analysis and Visualization** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4	**CO5** Understand how to use R for different types of data	SO5.1 SO5.2 SO5.3 SO5.4	LI5.1,LI5.2,LI5 .3	**Unit5: Introduction to Bayesian Modeling** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12	

A K S University

Faculty of Computer Application & Information Technology and Science

Department of Computer Application & Information Technology

BCA (Bachelor of Computer Applications)

Semester-VIII

Course Code: 6CA851

Course Title: Research Project

Pre- requisite: Student should have knowledge of programming languages, Software Engineering, and Many more tools and framework.

Rationale: To apply the knowledge and skills learnt in previous semesters, to solve real life industrial / engineering / professional problems.

To modify/ improve the existing engineering / professional systems.

To develop systems / components / methods / processes / resources to cater the needs of the nearby small scale / medium industry.

To learn to solve real life engineering / professional problems which often have many aspects to be considered and addressed.

Course Outcomes:

6CA851.1: - The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.
6CA8512: - The student will be able to implement the project plan and manage the project.
6CA851.3: - The student will be able to present the completed project work.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Project	6CA851	Research Project	0	20	0	1	4	10

INTRODUCTION TO PROJECT WORK

Project work is a very important course in all branches of diploma Programmes. It offers following opportunities to students of final semester: -

To learn skills and abilities which are otherwise not possible either inclassroom or in structured environment of laboratory such as: -

- Skill to work in groups or teams,
- Skill to face real life professional problems and to create reallife solutions for them.
- Skill to take professional decisions under real life constraints and circumstances,
- Skill to learn in self-directed way to pursue the specific professional projects (Self Directed Learning)
- Skill to learn from real life self- experiences (l i f e l o n g learning)
- Skill to manage the real- l i f e engineering / professional projects
- Skill to plan and organize the self / group professional work

- Skills to apply the engineering management principles in real lifeprofessional projects
- Skill to defend / justify self-real-life engineering / professionalwork in front of significant others
- Skill to complete the professional tasks / work keeping in viewsocietal, legal and environmental considerations
- Skill to collect relevant data in real life situations
- Skill to relate engineering / professional knowledge gained in various semesters with real life engineering / professional problems
- Skill to estimate the duration and costs in real life engineering / professional work
- Skill to assess the theoretical feasibility, financial feasibility and time feasibility of real-life engineering / professional tasks.

With an objective to ensure the learning of above skills and abilitiesas well as to earn maximum marks in NBA assessment,

The Course on Project Work consists of five phases: -

	Description of phases	Learn Hrs.
1	Literature / industry's need survey and finalization of topic / title	15Hrs
2	Detailed planning of the project work	
3	Implementing the detailed project plan	60Hrs
4	Managing the project activities	
5	Reporting of the project work output /outcome / prototype	15Hrs
	Total	90 Hrs

General Guidelines for Project Work

- The project topics should be related to concerned branch of engineering / profession, but, should not be the exact content of the curriculum taughtin the discipline.
- Student's project topics should be preferably 'real life' topics. It means the project topics should have substantial element of uncertainty, complexity and multi-disciplinary-ness which can be coped up by the students. These elements offer opportunities to students to apply engineering/ professional knowledge in real life settings, solve real life problems and to take real life decisions. As a project guide, concerned teacher should ensure these by suitably altering / framing / reframing the statement of topic / title.
- The project topics should be such that students can get opportunity to refer IS codes, Manuals, Handbooks, norms and standards, opportunity to conduct standard tests, and opportunity to operate modern laboratory equipment's following SOPs.
- For student's interest, active participation and ownership in the project work, their self-motivation is necessary. Therefore, students should be actively involved in finalizing the topic of project.
- Students should be asked to conduct a brief review of literature for problems and issues in their engineering / professional areas of interest,where they think they can contribute effectively. The project guide should facilitate them in this regard, through his/her expertise and experience.

Every student group should be asked to propose at least three topics oftheir interest.

- The topics proposed by student project groups should be assessed bythe facilitator-teacher on following three criteria: -
    - **The work on the topic should be theoretically and practically feasible.**
    - **The project work on the topic should be completed within approx. Three and half months.**
    - **Availability of required resources should be certain. Cost of project work should also be bearable.**
- Normally, students' project works should be carried out in small groups (1 to 2 students).
- All faculty members of department should be engaged as project guides. Every faculty member should be project guide of at least one student project group.
- Normally, project guides should be assigned to the students through lottery system and students under each faculty should be asked to formtheir small groups.

COs, POs and PSOs Mapping

Course Title: BCA

Course Code: 06CA851

Course Title: Research Project

Course Outcomes	Program Outcomes												Program Specific Outcome				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PS0 5
	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct studies of difficult problems	Utilization of modern tools	Engineers and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	Use fundamental knowledge of math, science, and engineering to comprehend, evaluate, and create computer Programmes in the fields of algorithms, multimedia, big data analytics, machine learning, artificial intelligence, and networking for the effective design of computer-based systems of various complexity	Utilize relevant methods and cutting-edge hardware and software engineering tools to develop and integrate computer systems and related technologies. This PSO2 also encourages lifelong learning for the advancement of technology and its use in multidisciplinary settings	Applying professional engineering solutions for societal improvement while taking into account the environmental context, being conscious of professional ethics, and being able to effectively communicate.	Learn and use the most recent Artificial Intelligence and Data Science technologies in the fields of engineering and computer science	Recognize and examine issues in real life, then offer creative software solutions with the help of AI and Data Science Technologies.
CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	2	3	3	2	3	2	3	1	3	1	3	3	2	3	3	1	2
CO 2: The student will be able to implement the project plan and manage the project.	2	3	3	2	3	2	3	1	3	1	3	3	2	2	2	2	3
CO 3: The student will be able to present the completed project work.	2	2	3	1	3	2	2	1	3	1	3	3	2	3	2	2	2

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 1: The student will be able to prepare a detailed project plan for solving any real-life related engineering / technical / professional / industrial problem.	-	-	-	As mentioned in page number _ to _
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 2: The student will be able to implement the project plan and manage the project.	-	-	-	
PO 1,2,3,4,5,6,7, 8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 3: The student will be able to present the completed project work.	-	-	-	