SGT UNIVERSITY

SHREE GURU GOBIND SINGH TRICENTENARY UNIVERSITY
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Budhera, Gurugram-Badli Road, Gurugram (Haryana) - 122505. Ph. : 0124-2278183, 2278184, 2278185

Faculty of Engineering and Technology

Department of Computer Science & Engineering

Three-Year Full-Time Education Program

Bachelor of Computer Applications
(Cloud Computing/
Artificial Intelligence & Machine Learning/ Data Science/Web Programming/ Cybersecurity)

With effect from Session 2024 - 25

Bachelor of Computer Applications(Web Programming/Data Science/CyberSecurity/AI&ML/Cloud Computing)- AY 2024-25

Course Structure

Semester	Discipline Specific Courses – Core					MOOC	Program Elective courses	Minor Electives Courses	Internship/ Industrial Training/	Inter disciplinary courses	Training Enhancement courses	Value Added Courses	Skill Enhancement courses	L	T	P	Credits
I	Mathematics-I (3-1-0) 4	Fundamentals of Computers and IT (3-0-2) 4	Introduction to Programming Methodology using C (3-0-2) 4							MDP-I (3-0-0) 3	AECC-I (2-0-0) 2	VAC-I (2-0-0) 2	SEC-I (0-0-4) 2	17	1	8	22
II	Statistics for Computing (3-1-0) 4	Data Structure and Algorithms using C (3-0-2) 4	Web Programming (3-0-2) 4							MDP-II (3-0-0) 3	AECC-II (2-0-0) 2	VAC-II (2-0-0) 2	SEC-II (0-0-4) 2	17	1	8	22
Exit Point	Students exiting the programme after securing 44 credits will be awarded UG Certificate in the relevant Discipline /Subject provided they secure 4 credits in work based vocational courses offered during summer term or Internship / Apprenticeship in addition to 4 credits from skill-based courses earned during first and second semester.																
III	Object oriented Development using C++ (3-0-2) 4	Networks and Systems (3-0-2) 4				Personality Development & Career Building (2*-0-0) 0		Minor Electives Courses-III (3-0-2) 4	Summer Internship-I (0-0-4) 2	MDP-III (3-0-0) 3	AECC-III (2-0-0) 2	VAC-III (2-0-0) 2		17	0	16	22
IV	Database Management Systems (3-0-2) 4	Java Programming (3-0-2) 4	Minor Electives Courses-IV (3-0-0) 3			Quantitative Aptitude & Logical Reasoning (2*-0-0) 0	PE-I (3-0-0) 3	Minor Electives Courses-II (3-0-2) 4			AECC-IV (2-0-0) 2		SEC-III (0-0-4) 2	17	0	20	22
Exit Point	Students exiting the programme after securing 88 credits will be awarded UG Diploma in the relevant Discipline /Subject provided they secure additional 4 credit in skill based vocational courses offered during first year or second year summer term.																
V	Principles of Cyber Security (3-0-2) 4	Empirical Software Engineering (3-0-2) 4	Web development using PHP (3-0-2) 4				PE-II (3-0-2) 4	Minor Electives Courses-III (3-0-2) 4	Summer Internship – II (0-0-4) 2					11	0	14	22
VI	Problem Solving using Python (3-0-2) 4	Datawarehousing and Data Mining (3-0-2) 4	Innovations & Entrepreneurship (3-0-2) 4				PE-III (3-0-2) 4	Minor Electives Courses-VII (3-0-2) 4					SEC-IV (0-0-4) 2	11	0	14	22
Exit Point	Students who want to undertake 3-year UG programme will be awarded UG Degree in the relevant Discipline /Subject upon securing 132 credits																
* - Non-Credit Course																	132

Minor Elective Pool					
Minor Specialization	MEC-III (3rd Sem)	MEC-IV (4th Sem)	MEC-V (5th Sem)	MEC-VI (6th Sem)	MEC-VII (7th Sem)
Cloud Computing	Virtualization Concepts	Cloud Security Essentials	Private Cloud Management	Cloud Computing Architectures and Deployment models	Cloud and Fog Computing
AIML	Essentials of AI & ML	Data Mining & Prediction Modeling	Deep Learning and Neural Network	Natural Language Processing	R Programming for Data Analytics & Visualization
Data Science	Overview of Data Science and Machine Learning	Introduction to Data Science Tools	Computational Data Analytics	Data Analysis and Visualization	Big Data Technologies
Web Programming	Web Development Frameworks(React, Angular, Vue.js)	Advanced Web Development(APIs, AJAX)	UI / UX Design	Mobile Web Development(Responsive Design, PWAs)	Full Stack Development
Cybersecurity	Cyber Security Fundamentals	Cryptography and Network Security	IDS Security and Access Control	Cyber Threats and Attacks	Ethical Hacking and Penetration Testing

Program Elective Pool		
PE-1 6th Sem	PE-2 5th Sem	PE-3 6th Sem
Advances in Operating Systems	Algorithms Design and Complexity Theory	Computer Graphics & Video
IoT Networks and Protocols	Automata Theory and Computability	Compiler Design
Industrial and Medical IoT	Reinforcement learning	Image and Video Processing

AEC Courses		Value Added Courses	
AEC-I (Odd Sem)	Computational Thinking and Programming	VAC (Odd Sem)	Applied Artificial Intelligence
AEC-II (Even Sem)	Problem Solving using Python	VAC (Even Sem)	Applied Cloud Computing

SEC Courses			
SEC-I	SEC-II	SEC-III	SEC-IV
New Age Skill	MATLAB	PC Networking Lab	Mobile Application Development

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Head of the Department

Dean

Dean – Academic

1. NATURE AND EXTENT OF THE PROGRAM

The BCA course is a full time three years (six semesters) Bachelor's Degree in Computer Application. The basic objective of BCA Course is to provide young men and women with the required knowledge and necessary skills to get rewarding careers into the changing world of Information Technology. The course focuses on imparting knowledge and skills in computer technology that includes programming languages and database management.

Eligibility Criteria:

A candidate seeking admission to the BCA Course must have passed 10+2 (any stream) securing not less than 60% marks in aggregate (5% relaxation to ST/SC candidates) from the Central Board of Secondary Education or any other equivalent examination recognized by the Mizoram University preferably with Mathematics as one of compulsory or optional course, or any other vocational course related to the computer stream having either Computer Science or Computer Engineering as compulsory/optional course.

2. PROGRAM EDUCATION OBJECTIVES (PEOs)

After completing BCA, students will be able to:

PEO No.	Education Objective
PEO1	Demonstrate analytical and design skills including the ability to generate creative solutions and foster team-oriented professionalism through effective communication in their careers.
PEO2	Graduates would expertise in successful careers based on their understanding of formal and practical methods of application development using the concept of computer programming languages and design principles in national and international level.
PEO3	Exhibit the growth of the nation and society by implementing and acquiring knowledge of upliftment of health, safety and other societal issues.
PEO4	Implement their exhibiting critical thinking and problem- solving skills in professional practices or tackle social, technical and business challenges.

3. GRADUATE ATTRIBUTES

Sl. No.	Attributes	Description
1	Professional / Disciplinary Knowledge	BCA typically covers a broad range of topics related to computer hardware, software, algorithms, data structures, and programming languages.
2	Technical / Practical skills	In a BCA program, BCA students need to have a strong foundation in computer science concepts and programming languages such as Java, C++, Python, etc. In a BCA program, laboratory skills may involve setting up and configuring computer systems, installing software, and troubleshooting hardware and software issues. BCA students need to have practical skills in software development methodologies such as Agile, Scrum, and Waterfall. They need to be able to write code that is well-documented, modular, and maintainable. In summary, a BCA program requires a combination technical, laboratory and practical skills.

3	Communication Skill	In a BCA program, Communication skills are an essential part of education and can help students excel in various aspects of their career. BCA students must develop excellent communication skills to become successful software professionals.
4	Conduct	BCA student conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
5	Modern Tool Usage	Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	The Engineer and Society	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7	Environment and Sustainability	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9	Individual and Team Work	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11	Project Management and Finance:	Demonstrate knowledge and understanding of computer applications and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long Learning:	Recognize the need for and have the preparation and ability to Engage in independent and life-long learning in the broadest context of technological Change.

4. QUALIFICATION DESCRIPTORS:

BCA (Bachelor of Computer Applications) is an undergraduate program that prepares students for a career in the field of computer science and technology. Some of the qualification descriptors for BCA program are:

Technical knowledge: BCA graduates should have a strong foundation in computer science concepts and should be familiar with programming languages, algorithms, data structures, operating systems, databases, computer networks, and other related technologies.

Analytical skills: BCA graduates should possess strong analytical skills to analyze and solve complex problems related to computer systems and software applications.

Creativity: BCA graduates should be able to think creatively to design and develop innovative software applications, websites, and computer systems.

Teamwork: BCA graduates should be able to work collaboratively in a team environment to develop and implement software applications and computer systems.

Communication skills: BCA graduates should possess excellent communication skills to articulate technical concepts and ideas to a diverse audience.

Project management skills: BCA graduates should have project management skills to plan, organize, and execute software development projects successfully.

Ethical and professional conduct: BCA graduates should adhere to ethical and professional conduct n their work and be aware of the impact of technology on society and the environment.

5. PROGRAM OUTCOME

PO No.	Attribute	Competency
PO1	Professional knowledge	Professional Knowledge: Refers to the expertise and understanding of a particular field or profession, including its principles, concepts, theories, and practices. It is the foundation upon which individuals build their professional skills and develop their careers.
PO2	Technical skills	Technical Skills: Refers to the abilities and expertise needed to perform specific tasks within a clinical or technical setting. This includes skills such as diagnostic assessment, treatment planning, technical procedures, and the use of specialized equipment.
PO3	Team work	Team work: Refers to the ability to work collaboratively with others towards a common goal. This involves effective communication, coordination, and cooperation among team members, as well as a willingness to share responsibilities and support others in achieving their objectives.
PO4	Ethical value & professionalism	Ethical Value & Professionalism: Refers to the principles, values, and behaviors that are expected of professionals in their work. This includes a commitment to ethical behavior, honesty, integrity, respect for others, and a dedication to upholding the highest standards of professionalism in one's field.
PO5	Communication	Communication: This includes the use of verbal and nonverbal communication skills, active listening, and the ability to adapt communication style to different audiences and situations.

PO6	Evidence based practice/learning	Evidence-Based Practice/Learning: Refers to the use of the best available evidence to guide decision-making and practice in a particular field or profession.
PO7	Life-long learning	Lifelong Learning: Refers to the ongoing process of acquiring new knowledge, skills, and competencies throughout one career. This involves a commitment to continuous learning and professional development, as well as a willingness to adapt to changes in one's field or profession.
PO8	Entrepreneurship, leadership and mentorship	Entrepreneurship: Refers to the ability to identify and pursue opportunities to create new ventures or initiatives within a particular field or profession. This involves a willingness to take risks, innovate, and adapt to changing market conditions. Leadership: Refers to the ability to inspire, motivate, and guide others towards a common goal. This involves setting a clear vision, establishing a culture of collaboration and accountability, and providing direction and support to team members. Mentorship: Refers to the process of providing guidance, support, and advice to individuals who are seeking to develop their skills and advance their careers. This involves sharing knowledge and experience, providing feedback and encouragement, and serving as a role model and advocate for others.

6. PROGRAM SPECIFIC OUTCOME

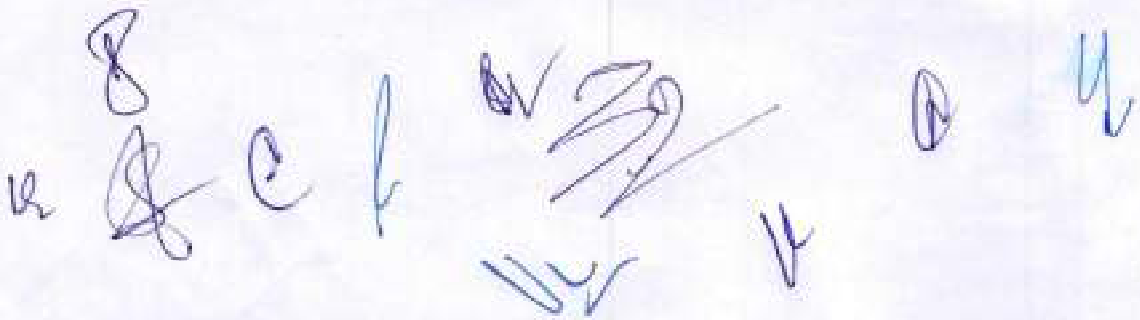
PSO No.	Competency
PSO1	Graduates of the program will be able to design, implement, and maintain complex software systems using a range of programming languages and tools.
PSO2	Graduates of the program will be able to analyze and solve complex problems in Computer Science & Engineering using a range of algorithms and data structures.
PSO3	Graduates of the program will be able to communicate effectively with technical and non-technical audiences, and work collaboratively in teams to solve complex problems.

7. COURSE STRUCTURE

SEMESTER – I

Course Code	Course Title	Credit Distribution (Hours/Week)				Marks Distribution		
		L	T	P	C	IAE	ESE	Total
	Mathematics- 1	3	1	0	4	40	60	100
	Fundamentals of Computers and IT	3	0	0	3	40	60	100
	Fundamentals of Computers and IT Lab	0	0	2	1	20	30	50
	Introduction to Programming Methodology using C	3	0	0	3	40	60	100
	Introduction to Programming Methodology using C Lab	0	0	2	1	20	30	50
	MGE-I	4	0	0	4	40	60	100
	AECC-I	2	0	0	2	20	30	50
	VAC-I	2	0	0	2	20	30	50
	SEC-I	0	0	4	2	20	30	50
Total		**17**	**1**	**8**	**22**	**260**	**390**	**650**

Note – L: Lecture Hour/week, T: Tutorial Hour/week, P: Practical Hour/week, C: Credits, IAE: Internal Assessment Examination, ESE: End Semester Examination



SEMESTER – II

Course Code	Course Title	Credit Distribution (Hours/Week)				Marks Distribution		
		L	T	P	C	IAE	ESE	Total
	Statistics for Computing	3	1	0	4	40	60	100
	Data Structures and Algorithms using C	3	0	0	3	40	60	100
	Data Structures and Algorithms using C Lab	0	0	2	1	20	30	50
	Web Programming	3	0	0	3	40	60	100
	Web Programming Lab	0	0	2	1	20	30	50
	MGE-II	4	0	0	4	40	60	100
	AECC-II	2	0	0	2	20	30	50
	VAC-II	2	0	0	2	20	30	50
	SEC-II	0	0	4	2	20	30	50
Total		**17**	**1**	**8**	**22**	**260**	**390**	**650**

Note – L: Lecture Hour/week, T: Tutorial Hour/week, P: Practical Hour/week, C: Credits, IAE: Internal Assessment Examination, ESE: End Semester Examination

Exit Point

Certification Course in Bachelor of Computer Applications (Web Programming/Data Science/Cybersecurity/Artificial Intelligence & Machine Learning/Cloud Computing).

At the end of first year the student can work as Designer as a freelancer.

Entry Point

Two years Diploma or One-year Certification Course in Bachelor of Computer Applications and in lieu of summer internship of 4-6 weeks student has to complete MOOC Course of 4-6 weeks (2 Credits) in 3rd Semester.

SEMESTER – III

Course Code	Course Title	Credit Distribution (Hours/Week)				Marks Distribution		
		L	T	P	C	IAE	ESE	Total
	Object oriented Development using C++	3	0	0	3	40	60	100
	Object oriented Development using C++ Lab	0	0	2	1	20	30	50
	Networks and Systems	3	0	0	3	40	60	100
	Networks and Systems Lab	0	0	2	1	20	30	50
	Personality Development & Career Building (MCNC)	2*	0	0	-	-	-	-
	Minor Electives Courses-III	3	0	0	3	40	60	100
	Minor Electives Courses-III Lab	0	0	2	1	20	30	50
	Summer Internship-I	0	0	4	2	20	30	50
	MGE-III	4	0	0	4	40	60	100
	AECC-III	2	0	0	2	20	30	50
	VAC-III	2	0	0	2	20	30	50
Total		**17**	**0**	**10**	**22**	**280**	**420**	**700**

Note – L: Lecture Hour/week, T: Tutorial Hour/week, P: Practical Hour/week, C: Credits,
IAE: Internal Assessment Examination, ESE: End Semester Examination.
MCNC: Mandatory Course Non-Credit, *: Non-Credit Course

SEMESTER – IV

Course Code	Course Title	Credit Distribution (Hours/Week)				Marks Distribution		
		L	T	P	C	IAE	ESE	Total
	Database Management Systems	3	0	0	3	40	60	100
	Database Management Systems Lab	0	0	2	1	20	30	50
	Java Programming	3	0	0	3	40	60	100
	Java Programming Lab	0	0	2	1	20	30	50
	Minor Electives Courses-IV	3	0	0	3	40	60	100
	PE-I	3	0	0	3	40	60	100
	Quantitative Aptitude & Logical Reasoning (MCNC)	2*	0	0	-	-	-	-
	Minor Electives Courses-V	3	0	0	3	40	60	100
	Minor Electives Course V Lab	0	0	2	1	20	30	50
	AECC-IV	2	0	0	2	20	30	50
	SEC-III	0	0	4	2	20	30	50
Total		**17**	**0**	**10**	**22**	**300**	**450**	**750**

Note – L: Lecture Hour/week, T: Tutorial Hour/week, P: Practical Hour/week, C: Credits,
IAE: Internal Assessment Examination, ESE: End Semester Examination
MCNC: Mandatory Course Non-Credit, *: Non-Credit Course

Exit Point

Certification Course in Bachelor of Computer Applications (Web Programming/Data Science/Cybersecurity/Artificial Intelligence & Machine Learning/Cloud Computing).

At the end of second year the student can work as Developer as a freelancer.

Entry Point

Two-year Diploma Course in Bachelor of Computer Applications and in lieu of summer internship of 4-6 weeks student has to complete MOOC Course of 4-6 weeks (2 Credits) in 5th Semester.

SEMESTER – V

Course Code	Course Title	Credit Distribution (Hours/Week)				Marks Distribution		
		L	T	P	C	IAE	ESE	Total
	Principles of Cyber Security	3	0	0	3	40	60	100
	Principles of Cyber Security Lab	0	0	2	1	20	30	50
	Empirical Software Engineering	3	0	0	3	40	60	100
	Empirical Software Engineering Lab	0	0	2	1	20	30	50
	Web Development using PHP	3	0	0	3	40	60	100
	Web Development using PHP Lab	0	0	2	1	20	30	50
	PE-II	3	0	0	3	40	60	100
	PE-II Lab	0	0	2	1	20	30	50
	Minor Electives Courses-VI	3	0	0	3	40	60	100
	Minor Electives Courses-VI Lab	0	0	2	1	20	30	50
	Summer Internship - II	0	0	4	2	20	30	50
Total		**15**	**0**	**14**	**22**	**320**	**480**	**800**

Note – L: Lecture Hour/week, T: Tutorial Hour/week, P: Practical Hour/week, C: Credits,
IAE: Internal Assessment Examination, ESE: End Semester Examination

SEMESTER – VI

Course Code	Course Title	Credit Distribution (Hours/Week)				Marks Distribution		
		L	T	P	C	IAE	ESE	Total
	Problem Solving using Python	3	0	0	3	40	60	100
	Problem Solving using Python Lab	0	0	2	1	20	30	50
	Data warehousing and Data Mining	3	0	0	3	40	60	100
	Data warehousing and Data Mining Lab	0	0	2	1	20	30	50
	Innovations & Entrepreneurship	3	0	0	3	40	60	100
	Innovations & Entrepreneurship Lab	0	0	2	1	20	30	50
	PE-III	3	0	0	3	40	60	100
	PE-III Lab	0	0	2	1	20	30	50
	Minor Electives Courses-VII	3	0	0	3	40	60	100
	Minor Electives Courses-VII Lab	0	0	2	1	20	30	50
	SEC-IV	0	0	4	2	20	30	50
Total		**15**	**0**	**14**	**22**	**320**	**480**	**800**

Note – L: Lecture Hour/week, T: Tutorial Hour/week, P: Practical Hour/week, C: Credits, IAE: Internal Assessment Examination, ESE: End Semester Examination

Multidisciplinary Generic Electives (MGE)
Multidisciplinary Generic Electives is credited and choice-based. The students make a choice from a pool of MGE offered by the Faculty under the University. (Reference: University Umbrella Multidisciplinary Generic Electives)

Value Added Courses (VAC)
Value Added Courses are credited and choice-based. The students make a choice from the pool of VAC offered by the Faculty under the University. (Reference: University Umbrella Value Added Courses)

Ability Enhancement Compulsory Course (AECC)
Ability Enhancement Compulsory Courses are credited and choice-based. The students make a choice from the pool of AECC offered by the Faculty under the University. (Reference: University Umbrella Ability Enhancement Compulsory Course)

Skill Enhancement Courses (SEC)
Skill Enhancement Compulsory Courses are credited and choice-based. The students make a choice from the pool of SEC offered by the Faculty under the University.

SEC Courses

SEC-I	New Age Skill
SEC-II	MATLAB
SEC-III	PC Networking Lab
SEC-IV	Mobile Application Development

Minor Electives pool

	Cloud Computing	**AIML**	**Data Science**	**Web Programming**	**Cybersecurity**
MEC-III	Virtualization Concepts	Essentials of AI & ML	Overview of Data Science and Machine Learning	Web Development Frameworks (React, Angular, Vue.js)	Cyber Security Fundamentals
MEC-IV	Cloud Security Essentials	Data Mining & Predictive Modeling	Introduction to Data Science Tools	Advanced Web Development (APIs, AJAX)	Cryptography and Network Security
MEC-V	Private Cloud Management	Deep Learning and Neural	Computational Data Analytics	UI / UX Design	DB Security and Access Control

		Network			
MEC-VI	Cloud Computing Architecture and Deployment models	Natural Language Processing	Data Analysis and Visualization	Mobile Web Development (Responsive Design, PWA)	Cyber Threats and Attacks
MEC-VII	Cloud and Fog Computing	R Programming for Data Analytics & Visualization	Big Data Technologies	Full Stack Development	Ethical Hacking and Penetration Testing

Program Electives pool

PE-I	Advances in Operating Systems	IoT Networks and Protocols	Industrial and Medical IoT
PE-II	Algorithms Design and Complexity Theory	Automata Theory and Computability	Reinforcement Learning
PE-III	Computer Graphics & Vision	Compiler Design	Image and Video Processing

OVERALL CREDIT DISTRIBUTION TABLE

SEMESTER	HOURS PER WEEK			Total Credit	Marks Distribution		
	L	T	P	TC	IAE	ESE	Total
SEMESTER – I	17	1	8	22	260	390	650
SEMESTER – II	17	1	8	22	260	390	650
SEMESTER – III	17	0	10	22	280	420	700
SEMESTER – IV	17	0	10	22	300	450	750
SEMESTER – V	15	0	14	22	320	480	800
SEMESTER – VI	15	0	14	22	320	480	800
Total	98	2	64	132	1740	2610	4350

Note – L: Lecture Hour, T: Tutorial Hour, P: Practical Hour, TC: Total Credits, IAE: Internal Assessment Examination, ESE: End Semester Examination.

8. SEMESTER-WISE COURSE DETAILS

SEMESTER - I

Course Code	Course Title
	Mathematics- I
	Fundamentals of Computers and IT
	Fundamentals of Computers and IT Lab
	Introduction to Programming Methodology using C
	Introduction to Programming Methodology using C Lab
	MGE-I
	AECC-I
	VAC-I
	SEC-I

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Mathematics-I
Academic Year	I
Semester	I
Number of Credits	3
Course Prerequisite	Basic Mathematics
Course Synopsis	In this course, Students will learn about basic concepts of Engineering Mathematics such as Determinants, Matrices, Sequence and series, Differentiation and integration.

Course Outcomes:

At the end of the course students will be able to:

CO1	Familiarity with Matrices and Determinants.
CO2	To determine general term of series in AP and GP, Calculate sum of n terms of series.
CO3	To gain insight of differentiation and its applications.
CO4	To gain insight of integration and its applications.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	-	2	-	2	3	-

CO2	3	3	3	-	-	-	-	-	1	2	-
CO3	3	1	-	3	-	-	2	-	3	1	-
CO4	3	2	2	3	-	-	-	-	2	2	-
Average	3	2	1.2	2	-	-	1	-	2	2	-

Course Content

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
3	1		4

Unit	Content & Competencies
1	**Determinants and Matrices:** **Determinants:** Definition, Minors, Co-factors, Properties of Determinants (C1: knowledge) Applications of determinants in finding area of triangle (C3: Application) **Matrices:** Definition, Types of Matrices (C1: Knowledge) Apply Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse (C3: Application) Implement Solution of system of linear equation by Cramer's Rule (C3: Application)

2	**Sequence and Series:** Introduction to Sequences, Series, Arithmetic Progression (A.P), Geometric Progression (G.P) (C1: knowledge) Evaluate Relationship Between A. M. and G.M. (C5: Evaluation) Apply Sum to N terms of Special Series (C3: Application) Describe Principle of Mathematical Induction (C2: Comprehension)
3	**Differentiation:** Evaluate Derivative of a function, Derivatives of sum, differences, product, and quotient of functions (C5: Evaluation) Evaluate Derivative of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions (C5: Evaluation) Implement Logarithmic Differentiation, Derivatives of functions in parametric forms, Differentiation by substitution (C3: Application)
4	**Integration:** Evaluate Indefinite integrals (C5: Evaluation) Implement Methods of integration: by substitution, by parts, by partial fractions (C3: Application) Apply Integration of algebraic and transcendental functions (C3: Application)

Teaching Learning Strategies and Contact Hours

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1

Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

Assessment Methods:

Formative	**Summative**
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Mapping of Assessment with COs

Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	✓
Unit test	✓	✓	✓	✓
Mid Semester Examination 1	✓	✓	✓	✓
Mid Semester Examination 2	✓	✓	✓	✓
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback
References:	List of reference books
	1. Babu Ram, Engineering Mathematics, Pearson Education 2. Engineering Mathematics; Author, B. V. Ramana Publisher, Tata McGraw-Hill 3. Advanced Engineering Mathematics by RK Jain 4. Shanti Narayan, Differential calculus, Sultan Chand & Company.

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Fundamentals of Computers and Information Technology
Academic Year	I
Semester	I
Number of Credits	3
Course Prerequisite	Basics of Computers
Course Synopsis	In this course, Students will learn about fundamental concepts of computers, Number system, basics of Information Technology

Course Outcomes:

At the end of the course students will be able to:

CO1	Understanding the concept of input and output devices of Computers
CO2	Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices
CO3	Understand an operating system and its working, and solve common problems related to operating systems
CO4	Know fundamental concepts of computers, Number system, basics of Information Technology

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes :

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO 3
CO1	3	2	-	2	-	-	2	-	2	3	-
CO2	3	3	3	-	-	-	-	-	1	2	-
CO3	3	1	-	3	-	-	2	-	3	1	-
CO4	3	2	2	3	-	-	-	-	2	2	-
Average	3	2	1.2	2	-	-	1	-	2	2	-

Course Content:

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
3			3

Unit	Content & Competencies
1	**Introduction to Computers:** Describe Evolution of computers: Computer Generation from First Generation to Fifth Generation. (C1: Knowledge) Classifications of Computers: Micro, Mini, Mainframe and supercomputers, Distributed Computer System, Parallel Computers. (C2: Comprehension) Explain Computer Hardware: Major Components of a digital computer, Block Diagram of a computer. (C2: Comprehension) Discuss Input devices, Output Devices. Computer Memory: Memory Cell (C2: Comprehension) Analysis of Memory Organization, Primary Memory: RAM & ROM, Secondary memory, Flash Drives, Solid State Drives. (C4: Analysis)

2	**Introduction to System Software and Operating System:** Describe Computer Software: Machine language, Assembly language, high-level languages, fourth generation language, assemblers, compilers, interpreters, linkers, loaders. (C2: Comprehension) Analyze Operating System concepts: different types of operating systems, functions of operating system (C4: Analysis) Implement the concept of multiprogramming, multitasking, multithreading, multiprocessing, time-sharing, real time, single-user & multi-user operating system. (C3: Application)
3	**Number Systems:** Introduction to number systems, Decimal number system-Definition, digits, radix/base, Binary number system – Bit Byte (C1: knowledge) Apply Conversions: Binary to Decimal and Decimal to Binary. Octal number system Conversion from Octal to Decimal to Octal, Octal to Binary and binary to Octal. Hexadecimal number system –Conversion: Decimal to Hex, Hex to decimal, Hex to Binary, Binary to Hex, Octal to Hex, Hex to Octal (C3: Application) Implement binary addition, subtraction, multiplication and division (only Integer part). (C3: Application) Evaluate 1's and 2's complement: 2's complement subtraction. (C5: Evaluation)
4	**Electronic Payment System:** Describe Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card (C2: Comprehension) Introduction to Bluetooth, Cloud Computing, Big Data, Data Mining, Mobile Computing and Embedded Systems and Internet of Things (IoT) (C1: knowledge)

Teaching Learning Strategies and Contact Hours

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	✓
Unit test	✓	✓	✓	✓
Mid Semester Examination 1	✓	✓	✓	✓
Mid Semester Examination 2	✓	✓	✓	✓
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback
References:	List of reference books
	1.P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications. 2. Anita Goel "Computer Fundamentals", Pearson. 3. Introduction to Computers by Peter Norton, Tata McGraw Hill

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Fundamentals of Computers and Information Technology Lab
Academic Year	I
Semester	I
Number of Credits	1
Course Prerequisite	NIL
Course Synopsis	In this course, Students will learn about fundamental concepts of Computers, basics of HTML Programming.

Course Outcomes:

At the end of the course students will be able to:

CO1	Understand basic concepts and organization of computer system
CO2	Understand Functions of Excel
CO3	Learn about basic HTML Commands
CO4	Learn to design web sites

Mapping of Course Outcomes (COs) to Program Outcomes (Pos) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	3	-	2	-	2	-	2	2	-	3

CO2	2	3	3	-	-	-	-	-	1	-	2
CO3	3	3	-	-	-	2	-	2	3	-	1
CO4	1	3	2	3	-	-	-	-	2	-	2
Average	2	3	1.2	2.5		1		1	2		2

Course Content:

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
-		2	2

Unit	Content & Competencies
1	Dismantling the system unit, recognize all major components inside a PC, describe function of each component and define the relationship of internal components (C1: Knowledge)
2	Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders (C3: Application)
3	Control panel – display properties, adding and removing software and hardware, setting date and time, screensaver and appearance. Using windows accessories. (C3: Application)
4	Documentation Using MS-Word – Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting (C4: Analysis)
5	Advance Features of MS-WordMail Merge, Tables, File Management, Printing, Styles, linking and embedding object, Template (C2: Comprehension)

6	MS-Excel – Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Advance features of MS-Excel-Pivot table & Pivot Chart (C5: Evaluation)
7	Presentation using MS-PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect (C6: Synthesis)
8	Create an office writer document and using tables distinguish between different types of memories (C6: Synthesis)
9	Draft a letter asking for quotations of different peripheral devices for your computer lab and mail the letter using mail merge in open office writer (C6: Synthesis)
10	Create a template and draw a basic block diagram of computer & using graphs compare the performance of different laptop/notebook PC (C6: Synthesis)
11	Evaluate basic HTML Tags (C5: Evaluation)
12	Create a table to show your class timetable. Use tables to provide layout to your HTML page describing your university infrastructure (C6: Synthesis)
13	Use frames in HTML such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks (C3: Application)
14	Create HTML pages showing timetable of trains departing from Delhi railway station (C6: Synthesis)
15	Create web pages for your college using HTML (C6: Synthesis)

Teaching - Learning Strategies and Contact Hours

Teaching - Learning Strategies	Contact Hours
Lecture	--
Practical	30
Seminar/Journal Club	--
Small group discussion (SGD)	20
Self-directed learning (SDL) / Tutorial	--
Problem Based Learning (PBL)	10
Case/Project Based Learning (CBL)	--
Revision	--
Others If any:	--
Total Number of Contact Hours	60

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	--
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination (OSPE)	University Examination
Quiz	--
Seminars	--
Problem Based Learning (PBL)	--
Journal Club	--

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA	✓	✓	✓	✓
Assignment / Presentation				
Unit test				

Practical Log Book/ Record Book	✓	✓	✓	✓
Mid-Semester Examination 1				
Mid-Semester Examination 2				
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback
References:	List of reference books
	1.Introduction to Computers by Peter Norton, Tata McGraw Hill 2.Learn HTML for Beginners: The illustrated guide to Coding by Jo Foster.

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Introduction to Programming Methodology using C
Academic Year	I
Semester	I
Number of Credits	3
Course Prerequisite	Fundamentals of Computers and IT
Course Synopsis	In this course, students will study about Programming concepts using C

Course Outcomes:

At the end of the course students will be able to:

CO1	Demonstrate problem solving skills by developing and implementing algorithms to solve problems
CO2	Implement programs using functional program pedagogy
CO3	Demonstrate an understanding of array, structures and pointers
CO4	Implement programs using functional program pedagogy

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	-	3	2	3	-	-	-	2	3	-
CO2	3	-	3	2	-	-	-	-	2	2	-

CO3	-	-	3	2	-	-	-	-	1	-	-
CO4	3	-	3	2	3	-	-	-	3	1	-
Average	2		3	2	1.5				2	1.5	

Course Content:

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
3			3

Unit	Content & Competencies
1	**Introduction:** Algorithms, flow charts, decision tables, pseudo code, characteristics of a good programming language (C1: Knowledge, C2: Comprehension) Planning the Computer Program: Concept of problem solving, Problem definition (C2: Comprehension) Program design (C6: Synthesis) Discuss Debugging, Types of errors in programming, Documentation. (C2: Comprehension) Explain Structured programming concepts (C2: Comprehension) Analyze Programming methodologies viz. top-down and bottom-up programming (C4: Analysis) Evaluate Advantages and disadvantages of Structured programming (C5: Evaluation)

2	**From algorithms to programs:** Explain source code, variables (with data types) variables and memory locations (C1: Knowledge) Distinguish Syntax and Logical Errors in compilation (C4: Analysis) Explain object and executable code, Arithmetic expressions and precedence (C2: Comprehension) Analyze Conditional Branching and Loops (C4: Analysis) Writing and evaluation of conditionals and consequent branching, Iteration and loops (C6: Synthesis) Construct Arrays: Arrays (1-D, 2-D), Character arrays and Strings (C6: Synthesis)
3	**Basic Algorithms:** Design Searching algorithms, Basic Sorting Algorithms (Bubble, Insertion and Selection) (C5: Evaluation) Finding roots of equations, notion of order of complexity through example programs (no formal definition required) (C5: Evaluation) Describe Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference (C2: Comprehension) Implement Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Quick sort, Merge sort. (C3: Application)
4	**Structure:** Structures, Defining structures and Array of Structures (C1: Knowledge) **Pointers:** Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, Accessing a Variable through its Pointer (C2: Comprehension, C3: Application)

Teaching Learning Strategies and Contact Hours

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	✓
Unit test	✓	✓	✓	✓
Mid Semester Examination 1	✓	✓	✓	✓
Mid Semester Examination 2	✓	✓	✓	✓
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback
References:	1.Byron Gottfried, Schaum's Outline of Programming with C, Tata McGraw-Hill 2. E. Bala Guruswamy, Programming in ANSI C, Tata McGraw-Hill

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Introduction to Programming Methodology using C Lab
Academic Year	I
Semester	I
Number of Credits	1
Course Prerequisite	Fundamentals of Computers and IT
Course Synopsis	In this course, Students will study about basic concepts of C Programming.

Course Outcomes:

At the end of the course students will be able to:

CO1	Demonstrate problem solving skills by developing and implementing algorithms to solve problems.
CO2	Implement programs using functional program pedagogy.
CO3	Demonstrate an understanding of array, structures and pointers.
CO4	Implement programs using functional program pedagogy.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PSO1	PSO 2	PSO3
CO1	3	2	3	2	-	-	1	-	2	-	2

CO2	3	2	-	-	1	-	1	-	-	-	-
CO3	3	2	-	-	-	-	1	-	-	-	-
CO4	3	2	2	3	2	-	1	-	1	-	1
Average	3	2	1.2	1.2	0.7	-	1	-	0.7	-	0.7

Course Content:

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
		2	2

Unit	Content & Competencies
1	Understand I/O statements, operators, expressions (C1: Knowledge)
2	Develop Decision-making constructs: if-else, go to, switch-case, break-continue (C6: Synthesis)
3	Design Loops: for, while, do-while (C6: Synthesis)
4	Implement Arrays: 1D and 2D, multi-dimensional arrays (C3: Application)
5	Implement Strings: operations (C3: Application)
6	Implement Functions: call, return, passing parameters by (value, reference), passing arrays to function (C3: Application)
7	Apply Recursion Concept using Factorial (C3: Application)
8	Show the concept of Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers (C2: Comprehension)
9	Demonstrate Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions (C3: Application)
10	Implement Files: reading and writing, File pointers, file operations, random access, processor directives (C3: Application)
11	Write a C program to find roots of a Quadratic equation (C1: Knowledge)

12	Write a C program to generate the Fibonacci sequence of first N numbers (C1: Knowledge)
13	Write a C program to check whether the given string is palindrome or not without using Library functions (C1: Knowledge)
14	Write a C program to generate Prime numbers in a given range using a user defined function (C1: Knowledge)
15	Write a C program to maintain a record of n student details using an array of structures with four fields - Roll number, Name, Marks and Grade. Calculate the Grade according to the given conditions. (C1: Knowledge)
16	Design a C program to input two matrices and perform matrix multiplication on them (C6: Synthesis)

Teaching - Learning Strategies and Contact Hours

Teaching - Learning Strategies	Contact Hours
Lecture	--
Practical	30
Seminar/Journal Club	--
Small group discussion (SGD)	20
Self-directed learning (SDL) / Tutorial	--
Problem Based Learning (PBL)	10
Case/Project Based Learning (CBL)	--
Revision	--
Others If any:	--
Total Number of Contact Hours	60

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	--
Viva-voce	Practical Examination & Viva-voce

Objective Structured Practical Examination (OSPE)	University Examination
Quiz	--
Seminars	--
Problem Based Learning (PBL)	--
Journal Club	--

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA	✓	✓	✓	✓
Assignment / Presentation				
Unit test				
Practical Log Book/ Record Book	✓	✓	✓	✓
Mid-Semester Examination 1				
Mid-Semester Examination 2				
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback
References:	1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill 2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

SEMESTER - II

Course Code	Course Title
	Statistics for Computing
	Data Structures and Algorithms using C
	Data Structures and Algorithms using C Lab
	Web Programming
	Web Programming Lab
	MGE-II
	AECC-II
	VAC-II
	SEC-II

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Statistics for Computing
Academic Year	I
Semester	II
Number of Credits	4
Course Prerequisite	Mathematics
Course Synopsis	In this course, students will study about Samples, population, Central Tendency, Permutation and Combination

Course Outcomes:

At the end of the course students will be able to:

CO1	Summarize data in a useful and informative manner, estimate and population, characteristic based on a sample
CO2	Analyze data using measures of dispersion
CO3	Apply the concepts of permutations and combinations
CO4	Determine if the data adequately represents the population

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO 4	PO5	PO 6	PO7	PO8	PSO1	PSO2	PSO3

CO1	3	-	3	1	3	-	-	1	-	1	1
CO2	2	-	2	3	2	-	-	3	-	3	2
CO3	3	-	1	1	1	-	-	1	-	2	1
CO4	3	-	3	3	3	-	-	3	-	1	2
Average	2.7		2.2	2	2.2			2		1.7	1.5

Course Content:

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
4			4

Unit	Content & Competencies
1	**Population, Sample and Data Condensation** Definition of statistics, Scope of statistics, Concept of population and simple with Illustration (C1: Knowledge) Describe Raw data, Attributes and variables (C2: Comprehension) Compare Frequency distribution, Cumulative frequency distribution (C4: Analysis)

2	**Measures of Central Tendency** Concept of central Tendency (C2: Understand) Analyze requirements of good measures of central tendency (C4: Analysis) Classify Arithmetic mean, Median, Mode, Harmonic Mean, Geometric mean for grouped and ungrouped data (C2: Understand) **Measures of Dispersion** Explain concept of dispersion (C2: Comprehension) Absolute measure of dispersion (C5: Evaluation) Relative measure of dispersion, Range variance (C5: Evaluation) Interpret Standard deviation, Coefficient of variation (C3: Application)
3	**Permutations and Combinations** Permutations of 'n' dissimilar objects taken 'r' at a time (with or without repetitions), ${}^nP_r = n!/(n-r)!$(without proof) (C6: Synthesis) Combinations of 'r' objects taken from 'n' objects, ${}^nC_r = n!/(r!\,(n-r)!)$ (C6: Synthesis) Simple examples of permutations and combinations, Applications (C3: Application)

4	**Sample Space, Events and Probability:** Experiments and random experiments (C5: Evaluation) Ideas of deterministic and non-deterministic experiments (C2: Comprehension) Definition of sample space, Discrete sample space, Events, Types of events, Union and intersections of two or more events, mutually exclusive events, Complementary event, Exhaustive event, Simple examples (C1: Knowledge) Classical definition of probability (C2: Comprehension) Apply Addition theorem of probability without Proof (up to three events are expected) (C3: Application) Definition of conditional probability (C1: Knowledge) Definition of independence of two events (C1: Knowledge, C2: Comprehension) Simple numerical problems (C3: Application)

Teaching Learning Strategies and Contact Hours

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1

Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	✓
Unit test	✓	✓	✓	✓
Mid Semester Examination 1	✓	✓	✓	✓
Mid Semester Examination 2	✓	✓	✓	✓
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback

References:	1. Levin, R.I. and Rubin D.S., Statistics for Management, Pearson Education.
	2. Gupta, S.P. and Gupta, M.P., Business Statistics, Sultan Chand and Sons.
	3. Sharma, J.K., Business Statistics, Vikas Publication House Pvt. Ltd.

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Data Structure and Algorithms using C

Academic Year	I
Semester	II
Number of Credits	3
Course Prerequisite	Programming Fundamentals
Course Synopsis	In this course, students will learn about a variety of data structures such as hash tables, search trees, tries, heaps, graphs, and analyze the algorithms to determine the time and computation complexity.

Course Outcomes:

At the end of the course students will be able to:

CO1	Analyze the algorithms to determine the time and computation complexity and justify the correctness
CO2	Write algorithms concerning various data structures like Stack, Queue, Linked list, Graph search and traversal techniques
CO3	Introduces a variety of data structures such as hash tables, search trees,heaps, graphs
CO4	Introduces sorting and pattern matching algorithms.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	-	-	-	1	-	1
CO2	3	-	2	-	2	-	-	-	-	3	1
CO3	3	-	2	3	2	-	-	-	-	-	1
CO4	3	3	2	-	2	-	-	-	2	1	1
Average	3	1.2	2	1	2	-	-	-	0.7	1	1

Course Content:

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
3			3

Unit	Content & Competencies

1	**Introduction:** Definition of data structures and abstract data types, Static and Dynamic implementations, Examples and real-life applications (C1: Knowledge) Construct Arrays: ordered lists, representation of arrays, sparse matrices, polynomial arithmetic (C6: Synthesis) **Running time:** Analysis of Algorithms and their complexities: Time Complexities, Big – Oh - notation, Running Times, Best Case, Worst Case, Average Case, Factors depends on running time (C4: Analysis) Implement Recursion (C3: Application) Implement Divide and Conquer Algorithm, Time & Space Trade-off (C3: Application) **Queues and Lists:** Construct Linked Lists: Singly linked lists (C6: Synthesis) Analyze the Representation of linked lists in memory (C4: Analysis) Apply Traversing, Searching, Insertion into, Deletion from linked list (C3: Application)

2	**The Stacks:** Evaluate ADT Stack and its operation (C5: Evaluation) Apply Array based implementation of stacks (C3: Application) Apply Linked List based implementation of stacks (C3: Application) Examples: Infix, postfix, prefix representation, Conversions, Applications, Algorithms and their complexities
3	**Trees:** Basic Terminology (C1: Knowledge) Construct Binary Trees and their representation, expression evaluation, Complete Binary trees, Extended binary trees, traversing binary trees (C6: Synthesis) **Graphs:** Describe Terminology and Representations (C2: Comprehension) Design Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs (C6: Synthesis)
4	**Sorting Algorithms:** Introduction to sorting algorithms (C1: Knowledge) Implement Sorting by exchange, selection sort, insertion sort, Bubble sort, Straight selection sort, Efficiency of above algorithms (C3: Application) Apply Merge sort, Quick sort Algorithm analysis, heap sort: Heap Construction, Heap sort, bottom – up, Top – down (C3: Application) Analyze Heap sort approach (C4: Analysis) Design Searching **Algorithms**: Straight Sequential Search, Binary Search (C6: Synthesis)

Teaching Learning Strategies and Contact Hours

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	✓
Unit test	✓	✓	✓	✓
Mid Semester Examination 1	✓	✓	✓	✓
Mid Semester Examination 2	✓	✓	✓	✓
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback
References:	1. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Book source Pvt. Ltd. 2. R. L. Kruse, B. P. Leung, C. L. Tondo, "Data Structures and program design in C", PHI 3. Schaum's outline series, "Data Structure", McGraw Hills.

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Data Structure and Algorithms using C Lab
Academic Year	I
Semester	II
Number of Credits	1
Course Prerequisite	Programming Fundamentals
Course Synopsis	In this course, students will learn to design and implement data structure algorithms using C.

Course Outcomes:

At the end of the course students will be able to:

CO1	Analyze the algorithms to determine the time and computation complexity and justify the correctness.
CO2	Implement a given Search problem (Linear Search and Binary Search).
CO3	Write algorithms concerning various data structures like Stack, Queue, Linked list, Graph search and traversal techniques and analyze the same to determine the time and computation complexity
CO4	Write an algorithm for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and compare their performance in terms of Space and time complexity.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	3	1	2	-	1	-	1	2	-
CO2	2	-	3	-	2	-	-	-	-	-	-
CO3	2	-	3	-	2	-	-	-	3	-	-
CO4	2	2	3	3	2	-	3	-	2	1	-
Average	2	1	3	1	2	-	1	-	1.5	0.75	-

Course Content:			
L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
		2	2

Unit	Content & Competencies
1	Write a program for multiplication and transpose of array (C1: Knowledge)
2	Write a program to compute the transpose of a sparse matrix (C1: Knowledge)
3	Implement a program to implement push and pop operation in Stack (C3: Application)
4	Write a program to convert an Infix notation to postfix notation using stacks (C1: Knowledge)
5	Develop a program to evaluate postfix notation using stacks (C6: Synthesis)
6	Write a program to implement a linear queue (C1: Knowledge)
7	Demonstrate a program for swapping two numbers using call by value and call by reference strategies (C3: Application)
8	Develop a program to insert and delete a node in the linked list. The number of nodes to inserted and deleted should be governed by user (C6: Synthesis)
9	Write a program to implement a linear search arrays and linked list (C1: Knowledge)
10	Using iteration and recursion concepts write programs for finding the element in the array using the Binary search method (C6: Synthesis)
11	Write the programs to implement bubble sort (C1: Knowledge)
12	Write a program using iteration and recursion concepts for quicksort (C1: Knowledge)
13	Write a program to implement the tree traversal methods (C1: Knowledge)
14	Write a program that implements the following i) Insertion sort ii) Merge sort iii) Heap sort (C1: Knowledge)
15	Write a program to perform the following operations: a) Insert an element into a AVL tree. b) Delete an element from a AVL tree. c) Search for a key element in a AVL tree. (C1: Knowledge)

Teaching - Learning Strategies and Contact Hours

Teaching - Learning Strategies	Contact Hours
Lecture	--
Practical	30
Seminar/Journal Club	--
Small group discussion (SGD)	20
Self-directed learning (SDL) / Tutorial	--
Problem Based Learning (PBL)	10
Case/Project Based Learning (CBL)	--
Revision	--
Others If any:	--
Total Number of Contact Hours	60

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	--
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination (OSPE)	University Examination
Quiz	--
Seminars	--
Problem Based Learning (PBL)	--
Journal Club	--

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA	✓	✓	✓	✓
Assignment / Presentation				
Unit test				
Practical Log Book/ Record Book	✓	✓	✓	✓

Mid-Semester Examination 1				
Mid-Semester Examination 2				
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback

References:	1.E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Book source Pvt. Ltd. 2.R. L. Kruse, B. P. Leung, C. L. Tondo, "Data Structures and program design in C", PHI 3. Schaum's outline series, "Data Structure", McGraw Hills.

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Web Programming
Academic Year	I
Semester	II
Number of Credits	3
Course Prerequisite	Basics of Html, Basics of network programming
Course Synopsis	This course uses the syntax and semanties of HTML and XHTML and develop different parts of a web page to understand how CSS can enhance the design of a webpage. Learners will create and apply CSS styling to a webpage to get familiarity with the JavaScript language and understand Document Object Model handling of Java Script

Course Outcomes:

At the end of the course students will be able to:

CO1	Explain the historical context and justification for HTML over XHTML.
CO2	Develop HTML5 documents and adding various semantic markup tags.
CO3	Analyse various attributes, values and types of CSS.
CO4	Implement core constructs and event handling mechanisms of JavaScript.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO 2	PSO3
CO1	3	3	2	-	-	2	1	-	3	3	3
CO2	3	3	-	-	-	1	1	-	3	1	1
CO3	3	3	2	-	-	2	1	-	3	3	2
CO4	3	3	-	-	-	3	1	-	3	3	3
Average	3	3	1	0	0	2	1	0	3	2.5	2.25

Course Content

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
3			3

Unit	Content & Competencies
1	**Traditional HTML and XHTML:** First Look at HTML and XHTML, Hello HTML and XHTML World, (C1: Knowledge) HTML and XHTML: Version History, (C1: Knowledge) HTML and XHTML DTDs: The Specifications Up Close, (X)HTML Document Structure, Browsers and (X)HTML, The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup—Two Paths? (C3: Application)
2	**HTML5:** Hello HTML5, Loose Syntax Returns, XHTML5, (C1: Knowledge)

	HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, (C3: Application) HTML5's Open Media Effort, Client-Side Graphics with <canvas>, (C3: Application) HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications (C3: Application)
3	**Cascading Style Sheets (CSS):** Introduction, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, (C1: Knowledge) CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, (C3: Application) CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, (C3: Application) Text Properties, Border Properties, Element Box, padding Property, margin Property , (C3: Application) Case Study: Description of a Small City's Core Area. (C2: Comprehension)
4	**Tables and CSS, Links and Images:** Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural PseudoClass Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, (C1: Knowledge) CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, (C3: Application) Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element. (C3: Application)

Teaching Learning Strategies and Contact Hours

Learning Strategies	Contact Hours
Lecture	32
Practical	
Seminar/Journal Club	2
Small group discussion (SGD)	2
Self-directed learning (SDL) / Tutorial	1
Problem Based Learning (PBL)	2
Case/Project Based Learning (CBL)	2
Revision	4
Others If any:	
Total Number of Contact Hours	45

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	Mid Semester Examination 1
Quiz	Mid Semester Examination 2
Seminars	University Examination
Problem Based Learning (PBL)	Short Answer Questions (SAQ)
Journal Club	Long Answer Question (LAQ)

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz	✓	✓	✓	✓
Assignment / Presentation	✓	✓	✓	✓
Unit test	✓	✓	✓	✓
Mid Semester Examination 1	✓	✓	✓	✓
Mid Semester Examination 2	✓	✓	✓	✓

University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback
References:	List of reference books 1. Head First HTML programming by Eric Freeman published by O'Reilly 2. Web Design The Complete Reference by Thomas Powell published by Tata McGraw Hill.

Faculty of Engineering and Technology	
Name of the Department	Computer Science & Engineering
Name of the Program	Bachelor of Computer Applications
Course Code	
Course Title	Web Programming Lab
Academic Year	I
Semester	II
Number of Credits	1
Course Prerequisite	Basics of Programming
Course Synopsis	In this course, Students will study about basic and advanced concepts of HTML and CSS Programming.

Course Outcomes:

At the end of the course students will be able to:

CO1	Demonstrate problem solving skills by developing and implementing algorithms to solve problems.
CO2	Implement programs using functional program pedagogy.
CO3	Demonstrate an understanding of array, structures and pointers.
CO4	Implement programs using functional program pedagogy.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	-				2	2	

CO2	2	3	-	-	1				-	-	
CO3	-	3	-	-	-				-	-	
CO4	2	3	2	3	2				3	1	
Average	1.7	3	1.2	1.2	0.7				1.2	0.7	

Course Content:

L (Hours/Week)	T (Hours/Week)	P (Hours/Week)	Total Hour/Week
		2	2

Unit	Content & Competencies
1	Write an HTML code to display your education details in a tabular format. (C1: Knowledge)
2	Write an HTML code to display your CV on a web page. (C1: Knowledge)
3	Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links. (C1: Knowledge)
4	Write an HTML code to create a login form. On submitting the form, the user should get navigated to a profile page. (C1: Knowledge)
5	Write an HTML code to create a Registration Form. On submitting the form, the user should be asked to login with this new credentials. (C1: Knowledge)
6	Write an HTML code to create your Institute website, Department Website and Tutorial website for specific subject. (C1: Knowledge)
7	Write an HTML code to illustrate the usage of the following: □ Ordered List □ Unordered List □ Definition List (C1: Knowledge)

8	Write an HTML code to create a frameset having header, navigation and content sections. (C1: Knowledge)
9	Write an HTML code to demonstrate the usage of inline CSS. (C1: Knowledge)
10	Write an HTML code to demonstrate the usage of internal CSS. (C1: Knowledge)
11	Write an HTML code to demonstrate the usage of external CSS. (C1: Knowledge)
12	Creating Style Sheet (C6:Synthesis)
13	CSS Styling(Background, Text Format, Controlling Fonts) (C6:Synthesis)
14	CSS Id and Class (C6:Synthesis)
15	CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) (C6:Synthesis)
16	Creating page Layout and Site Designs. (C6:Synthesis)
17	Writing program in XML and create a style sheet in CSS & display the document in internet explorer. (C1: Knowledge)

Teaching - Learning Strategies and Contact Hours

Teaching - Learning Strategies	Contact Hours
Lecture	--
Practical	30
Seminar/Journal Club	--
Small group discussion (SGD)	20
Self-directed learning (SDL) / Tutorial	--
Problem Based Learning (PBL)	10
Case/Project Based Learning (CBL)	--
Revision	--
Others If any:	--
Total Number of Contact Hours	60

Assessment Methods:

Formative	Summative
Multiple Choice Questions (MCQ)	--
Viva-voce	Practical Examination & Viva-voce
Objective Structured Practical Examination (OSPE)	University Examination
Quiz	--
Seminars	--
Problem Based Learning (PBL)	--
Journal Club	--

Mapping of Assessment with COs

Nature of Assessment	CO1	CO2	CO3	CO4
Quiz				
VIVA	✓	✓	✓	✓
Assignment / Presentation				
Unit test				
Practical Log Book/ Record Book	✓	✓	✓	✓
Mid-Semester Examination 1				
Mid-Semester Examination 2				
University Examination	✓	✓	✓	✓

Feedback Process	Student's Feedback

References:	1. Learning Web Design: A beginner's Guide To HTML, CSS, JavaScript, and Web Graphics by Jennifer Robbins 2. Responsive Web Design with HTML5 and CSS3