

SCHEME AND CURRICULUM BOOK
BACHELOR OF TECHNOLOGY
in
Computer Science and Engineering
(Cyber Security)

UG DEGREE 4 YEAR PROGRAMME
Engineering and Technology
(w.e.f. Session 2022-2023)



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Gurugram University, Gurugram, Haryana

Preface

The overall well-being of a nation depends on the eminence of its human resource. Providing quality education plays a vital role in transforming people into valuable human resource. Well educated students of today will become innovators and leaders of tomorrow who are going to ensure a constructively competitive but sustainable and peaceful world for everyone. Keeping in the view the demand of the skills based on Cyber Security, the university has introduced a Bachelor of Technology Programme in Computer Science & Engineering (Cyber Security) in the Department of Computer Science & Engineering. We have designed the curriculum for B.Tech. Computer Science & Engineering (Cyber Security). The curriculum is designed around the framework of Outcome-Based Education (OBE) in which students are at the centre of teaching learning process. The salient features of the curriculum design are as follows:

1. To start with, four Programme Educational Outcomes are defined.
2. The twelve Programme Outcomes (POs) are taken from the Self Appraisal Report format of National Board of Accreditation (NBA) for undergraduate engineering programmes and two Programme Specific Outcomes (PSOs) are outlined to capture the specialisations of the B. Tech. CSE (Cyber Security) programme.
3. An induction programme of three weeks duration has been introduced to make the admitted students comfortable in their new environment. The induction programme continues in the form of participation in Sports club or Green club or Cultural, Literature and Film Club etc. for the remaining period of the programme. It is mandatory for every student to join in one of these clubs.
4. In addition to the professional core and elective courses, there is a provision for many courses from Basic Sciences, Engineering Sciences, Mathematics and Humanities. The non-credit mandatory courses are included to make students aware about constitution of India, issues related to environmental and sustainable development, and Indian traditional wisdom.
5. For every course, 4 to 6 Course Outcomes (COs) are defined which are concrete and measurable.
6. Guidelines for preparing sessional examination question papers and assignments have been framed for measuring the attainment levels of COs.
7. The internal and external evaluation criteria for various courses has been succinctly described.
8. The Course Outcomes (COs) are mapped to Programme Outcomes (POs) by defining a CO:PO articulation matrix for every course.
9. The methodology for computing the attainment levels for the Course Outcomes and Programme Outcomes is laid out.
10. The new curriculum has a focus on the problem solving and learning capabilities of the students. There are many laboratory courses which give students a hands-on experience in problem solving. Further, provisions for industry internship/training and project works make students ready to accept challenges and do research to solve difficult engineering problems.
11. Overall, the curriculum is made keeping in the view the continuous cycle of improvement in teaching learning process.

Contents

Chapter 1: General Information

Chapter 2: Scheme of B.Tech. CSE (Cyber Security) Syllabus

Chapter 3: Detailed Syllabus

Chapter 4: Guidelines for Internal assessment of Theory Courses.

4.1 Tools of assessment

4.2 Preparing sessional

4.3 Assignments

4.4 Computing Attainment Levels of COs

4.5 Submitting Internal Assessment Record

Chapter 5: Guidelines for Internal and External Assessment of Lab. Courses

Chapter 6: Guidelines for evaluating Industrial Training and Projects

Chapter 7: Computing PO attainment levels

Chapter1: General Information

Vision

Gurugram University aspires to be a front runner in global education; role model for institutional excellence, trans-cultural quality learning, intellectual growth, contemporary research, capacity building and nurturing socially and morally responsible disciples through a learner- centric approach. The university seeks to ensure a journey from studentship to epitome of discipleship by working on academic, professional, technical, industry and life skills of its students.

Mission

- 1. To become a socially conscious centre of knowledge and advancement equipped to take up the challenges of the global change as well as committed to empower its teachers for the development of the students.**
- 2. To move up through international alliances and collaborative initiatives to achieve global excellence.**
- 3. To create rigorous academic and research environment for creation of knowledge and its perpetual advancement.**
- 4. To attract and build people in a rewarding and inspiring environment by fostering freedom, empowerment, creativity, scientific zeal and innovation.**

DEPARTMENT OF ENGINEERING & TECHNOLOGY COMPUTER SCIENCE AND ENGINEERING (Cyber Security)

VISION

MISSION

ABOUT THE PROGRAM

The Department of Computer Science and Engineering at Gurugram University in Gurugram, Haryana, India, is an academic department that focuses on the study and research of computer science and engineering disciplines. While Gurugram University was established in 2017. The Department offers undergraduate postgraduate programs and Doctorate in computer science and engineering. These programs aim to provide students with a strong foundation in computer science principles, Artificial Intelligence, Cyber Security and Internet of Things related areas.

The department likely offers a wide range of courses that cover various aspects of computer science and engineering, such as data structures, operating systems, computer networks, databases, artificial intelligence, machine learning, and more. The curriculum is designed to equip students with the necessary knowledge and skills to pursue careers in the IT industry, research and development, or further studies in the field.

Moreover, the department may have well-qualified faculty members who are actively engaged in research and teaching. They may have expertise in different areas of computer science and engineering and may guide students in their academic pursuits and research projects.

In addition to academic programs, the department also organize workshops, seminars, and conferences to facilitate knowledge sharing and promote collaboration among students, faculty, and industry professionals.

NOTE:

- 1. The scheme will be applicable from Academic Session 2022-23 onwards.**
- 2. The scheme will also be applicable to the students who are admitted in 2022-23 academic session and are transiting in 3rd Semester of their program.**

B.TECH. PROGRAM

Computer Science and Engineering (Cyber Security)

PROGRAM EDUCATION OBJECTIVES

PEO1	To provide an in-depth understanding of the fundamentals of science and engineering concepts essential for a computer engineer and create a strong inception of lifelong learning to facilitate progressive careers in industry and in pursuit of higher studies
PEO2	To inculcate the knowledge of mathematical foundations with algorithmic principles and acquire technical and analytical skills to develop innovative solutions in solving complex real life problems
PEO3	To provide knowledge in computer science, modelling & design of computer based systems and make them skilled professional in the broad area of cyber security.
PEO4	To impart knowledge to develop, analyze, evaluate, design, test and implement software required for various applications.
PEO5	To equip our students with effective communication and personality skills, multi-disciplinary teamwork, become ethical and responsible engineer with fulfilling societal responsibilities.

PROGRAM OUTCOMES

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs With appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	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.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge To assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the Knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering 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.
PO12	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.

PROGRAM SPECIFIC OUTCOMES

PSO1	To understand, analyze and develop softwares and become proficient in the areas related to algorithms, networking, cyber security, web designing and apply their knowledge to solve practical real-life problems.
PSO2	To apply standard practices and strategies in IT security products for successful career and entrepreneurship.
PSO3	To develop data, resource, and adopt asset protection strategies for organizations, processes, peoples, and individuals through Cybersecurity-centric skills.

Chapter2: Scheme of B.Tech CSE (Cyber Security) Syllabus

GENERAL COURSE STRUCTURE & CREDIT DISTRIBUTION

MANDATORY INDUCTION PROGRAM (3-WEEKSDURATION)

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. A 3-week long induction program for the UG students entering the institution, right at the start, has to be planned. Normal classes will start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

TentativeactivitieswhichcanbeplannedinthisInductionProgrammeareas follows:

1. Physical Activity
2. Creative Arts
3. Universal Human Values
4. Literary
5. Proficiency Modules
6. Lectures by Eminent People
7. Visits to Local Area
8. Familiarization to Dept./Branch &Innovations

**Semester wise Structure and
Curriculum for
UG Course in
Computer Science and Engineering
(Cyber Security)
(Engineering and Technology)**

Gurugram University, Gurugram

GENERAL COURSE STRUCTURE & CREDIT DISTRIBUTION

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM

S. No.	Category	Breakup of Credits (Total 160)
1	Humanities and Social Sciences, including Management courses	8
2	Basic Science courses	25
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	20.5
4	Professional core courses	73
5	Professional Elective courses relevant to chosen specialization/branch	12
6	Open subjects – Electives from other technical and /or emerging subjects	12
7	Project work, seminar and internship in industry or elsewhere	16
8	Mandatory Courses [Environmental Sciences, Induction training, Constitution of India, Essence of Indian Traditional Knowledge]	Non-credit
	Total	166.5

SEMESTER-WISE SUMMARY OF THE PROGRAM

S. No.	Semester	No. of Contact Hours	Credits	Marks
1	I	26	19.5	900
2	II	27	22	900
3	III	26	22	1000
4	IV	26	21	900
5	V	29	25	1100
6	VI	26	22	900
7	VII	27	21	900
8	VIII	22	14	500
	Total	209	166.5	7100

COURSE CODE AND DEFINITIONS

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences, including Management courses
PCC	Professional core courses
PEC	Professional Elective courses
OEC	Open Elective courses
LC	Laboratory course
MC	Mandatory courses
PROJ	Project

CREDIT DISTRIBUTION IN THE FIRST YEAR OF THE UNDERGRADUATE ENGINEERING PROGRAM

Bachelor of Technology

(Cyber Security)

HUMANITIES & SOCIAL SCIENCES, INCLUDING MANAGEMENT (HSMC)

S. No.	Code No.	Course Title	Hours Per week			Total Credits	Semester
			L	T	P		
1.	HSE-101	Communication Skills in English	2	0	2	3	I
2.	ENV - 101	Basic of Environmental Science	2	0	0	2	I
3.	HSV-102	Human Values and Soft Skills	2	0	2	3	II
Total Credits						8	

BASIC SCIENCE COURSES (BSC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.	BSM - 101	Mathematics - I	3	1	0	4	I
2.	BSP- 101	Physics	3	1	0	4	I / II
3.	BSP-101P	Physics (P)	0	0	2	1	I / II
4.	BSM - 102	Mathematics - II	3	1	0	4	II
5.		Discrete Mathematics	3	0	0	3	III
6.		Aptitude Reasoning-I	3	0	0	3	III
7.		Aptitude Reasoning-II	3	0	0	3	IV
8.		Communication and Interpersonal Skills	3	0	0	3	V
Total Credits						25	

ENGINEERING SCIENCE COURSES (ESC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.	EEE-101	Basics of Electrical and Electronics Engineering	3	0	0	3	I / II
2.	EEE-101P	Basics of Electrical and Electronics Engineering(P)	0	0	2	1	I / II
3.	MEE-102P	Workshop Practices (P)	1	0	3	2.5	I / II
4.	CSE-101	Programming for Problem Solving Using C	3	0	0	3	I
5.	CSE-101P	Programming for Problem Solving Using C (P)	0	0	2	1	I
6.	CSE-103P	Engineering Graphics (Web Designing)	1	0	2	2	I / II
7.		Digital Electronics	3	0	0	3	III
8.		Digital Electronics (P)	0	0	2	1	III
9.		R Programming	3	0	0	3	III
10.		R Programming Lab (P)	0	0	2	1	III
Total Credits						20.5	

PROFESSIONAL CORE COURSES (PCC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1	CSE-102	Data Structure Using C	3	0	0	3	II
2	CSE-104	Object Oriented Concepts and Python Programming	3	0	0	3	II
3	CSE-102P	Data Structure Using C (P)	0	0	2	1	II
4	CSE-104P	Object Oriented Concepts and Python Programming (P)	0	0	2	1	II
5		Operating Systems	3	0	0	3	III
6		Introduction to Information Security	3	0	0	3	III
7		Introduction to Information Security (P)	0	0	2	1	III
8		Operating Systems Lab (P)	0	0	2	1	III
9		Computer Architecture and Organization	3	0	0	3	IV
10		Analysis and Design of Algorithms	3	0	0	3	IV
11		Analysis and Design of Algorithms Lab (P)	0	0	2	1	IV
12		AI Data Analytics using R	3	0	0	3	IV
13		AI Data Analytics using R (P)	0	0	2	1	IV
14		Cryptography and Security	3	0	0	3	IV
15		Cryptography and Security Lab (P)	0	0	2	1	IV
16		Soft Computing	3	0	0	3	IV
17		Database Management Systems	3	0	0	3	V
18		Database Management Systems Lab (P)	0	0	2	1	V
19		Theory of Computation	3	0	0	3	V
20		Block Chain Technology	3	0	0	3	V
21		Block Chain Technology Lab (P)	0	0	2	1	V
22		Programming in JAVA	3	0	0	3	V
23		Programming in JAVA Lab (P)	0	0	2	1	V
24		Computer Networks	3	0	0	3	VI
25		Computer Networks Lab (P)	0	0	2	1	VI
26		Cyber Data Science and its application	3	0	0	3	VI
27		Cyber Data Science and its application Lab (P)	0	0	2	1	VI
28		Intrusion Detection Systems	3	0	0	3	VI
29		Text and Web Intelligence	3	0	0	3	VII
30		Text and Web Intelligence Lab (P)	0	0	2	1	VII
31		Digital Forensics	3	0	0	3	VII
32		MOOC-1	3	0	0	3	VIII
33		MOOC-2	3	0	0	3	VIII
Total Credits						73	

PROFESSIONAL ELECTIVE COURSES (PEC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.		Professional Elective Course - I	3	0	0	3	V
2.		Professional Elective Course - II	3	0	0	3	VI
3.		Professional Elective Course - III	3	0	0	3	VI
4.		Professional Elective Course - IV	3	0	0	3	VII
Total Credits						12	

OPEN ELECTIVE COURSES (OEC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.		Open Elective Course – I	3	0	0	3	V
2.		Open Elective Course - II	3	0	0	3	VI
3.		Open Elective Course - III	3	0	0	3	VII
4.		Open Elective Course - IV	3	0	0	3	VII
Total Credits						12	

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

S. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			L	T	P		
1		Project-I	0	0	4	2	VI
2		Project-II	0	0	8	4	VII
3		Project-III / Industrial Project	0	0	16	8	VIII
4		Practical Training -I	0	0	2	1	V
5		Practical Training -II	0	0	2	1	VII
Total Credits						16	

MANDATORY COURSES

S. No.	Course Code	Course Title	Hours per week			Total Credits	Semester
			L	T	P		
1		Sports (Audit Course)	0	0	2	0	I
2		Indian Constitution	2	0	0	0	IV

**Semester-wise Structure and
Curriculum for
UG Course in
Computer Science and
Engineering
(CYBER SECURITY)**

B.Tech Computer Science and Engineering (Cyber Security) Scheme of Studies/Examination Semester I

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	HSMC		Communication Skills in English	2	0	0	2	30	70	100
3	BSC		Mathematics-I	3	1	0	4	30	70	100
4	ESC		Basic of Electrical and Electronics Engineering OR Physics	3 OR 3	0 OR 1	0 OR 0	3 OR 4	30 OR 30	70 OR 70	100 OR 100
5	ESC		Programming for problem solving using C	3	0	0	3	30	70	100
6	HSMC		Basics of Environmental Science	2	0	0	2	30	70	100
7	HSMC		Communication Skills in English (P).	0	0	2	1	50	50	100
8	ESC		Basic of Electrical and Electronics Engineering (P) OR Physics (P)	0 OR 0	0 OR 0	2 OR 2	1 OR 1	50 OR 50	50 OR 50	100 OR 100
9	ESC		Programming for problem solving using C (P)	0	0	2	1	50	50	100
10	ESC		Workshop Practices (P) OR Engineering Graphics (Web Designing)	1 OR 1	0 OR 0	3 OR 2	2.5 OR 2	50 OR 50	50 OR 50	100 OR 100
11	AU		Sports (Audit Course) Compulsory	0	0	2	0	0	0	0
Total				14	1	11	19.5			900

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

B.Tech. Computer Science and Engineering (Cyber Security) Scheme of Studies/Examination Semester II

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total	
				L	T	P					
1	BSC		Mathematics-II	3	1	0	4	30	70	100	
3	HSMC		Human Value & Soft Skills	2	0	2	3	30	70	100	
4	ESC		Basic of Electrical and Electronics Engineering	3	0	0	3	30	70	100	
			OR Physics	OR	OR	OR	OR	OR	OR	OR	OR
				3	1	0	4	30	70	100	
5	PCC		Data Structure Using C	3	0	0	3	30	70	100	
6	PCC		Object Oriented Concepts and Python Programming	3	0	0	3	30	70	100	
7	ESC		Basic of Electrical and Electronics Engineering	0	0	2	1	50	50	100	
			(P) OR Physics (P)	OR	OR	OR	OR	OR	OR	OR	OR
				0	0	2	1	50	50	100	
8	LC		Data Structure Using C (P)	0	0	2	1	50	50	100	
9	LC		Object Oriented Concepts and Python Programming (P)	0	0	2	1	50	50	100	
10	ESC		Workshop Practices (P)	1	0	3	2.5	50	50	100	
			OR Engineering Graphics (Web Designing)	OR	OR	OR	OR	OR	OR	OR	OR
				1	0	2	2	50	50	100	
Total				15	2	10	22			900	

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

B.Tech. Computer Science and Engineering (Cyber Security)

Scheme of Studies/Examination

Semester - III

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	ESC		Digital Electronics	3	0	0	3	30	70	100
2	PCC		Introduction to Information Security	3	0	0	3	30	70	100
3	BSC		Discrete Mathematics	3	0	0	3	30	70	100
4	ESC		R Programming	3	0	0	3	30	70	100
5	PCC		Operating Systems	3	0	0	3	30	70	100
6	LC		Digital Electronics (P)	0	0	2	1	50	50	100
7	LC		Introduction to Information Security (P)	0	0	2	1	50	50	100
8	LC		R Programming (P)	0	0	2	1	50	50	100
9	LC		Operating Systems (P)	0	0	2	1	50	50	100
10	BSC		Aptitude Reasoning- I	3	0	0	3	30	70	100
Total				18	0	8	22			1000

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

B.Tech. Computer Science and Engineering (Cyber Security)

Scheme of Studies/Examination Semester - IV

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	BSC		Aptitude Reasoning -II	3	0	0	3	30	70	100
2	PCC		Computer Architecture and Organization	3	0	0	3	30	70	100
3	PCC		Analysis and Design of Algorithms	3	0	0	3	30	70	100
4	PCC		AI Data Analytics using R	3	0	0	3	30	70	100
5	PCC		Cryptography and Security	3	0	0	3	30	70	100
6	PCC		Soft Computing	3	0	0	3	30	70	100
7	LC		Cryptography and Security Lab (P)	0	0	2	1	50	50	100
8	LC		Analysis and Design of Algorithms Lab (P)	0	0	2	1	50	50	100
9	LC		AI Data Analytics using R Lab (P)	0	0	2	1	50	50	100
10	AU		Indian Constitution*	2	0	0	0	Refer Note: 1 (Grading)		
Total				20	0	6	21			900

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

**B.Tech. Computer Science and Engineering
(Cyber Security)
Scheme of Studies/Examination
Semester - V**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Database Management Systems	3	0	0	3	30	70	100
2	PCC		Theory of Computation	3	0	0	3	30	70	100
3	PCC		Programming in JAVA	3	0	0	3	30	70	100
4	PCC		Block Chain Technology	3	0	0	3	30	70	100
5	OEC		Open Elective I	3	0	0	3	30	70	100
6	PEC		Professional Elective I	3	0	0	3	30	70	100
7	BSC		Communication and Interpersonal Skills	3	0	0	3	30	70	100
8	LC		Database Management Systems Lab (P)	0	0	2	1	50	50	100
9	LC		Programming in JAVA Lab (P)	0	0	2	1	50	50	100
10	LC		Block Chain Technology Lab (P)	0	0	2	1	50	50	100
			Practical Training-I	0	0	2	1	50	50	100
Total				21	0	8	25			1100

NOTE:

1. Choose any one from Professional Elective Course – I
2. Choose any one from Open Elective Course – I*

Professional Elective Course – I

1. Introduction to Physical and Systems Security
2. Software Security and Trusted Systems
3. Biometrics
4. Cyber Security Threats

*** Open Elective Course – I**

To be chosen from the bucket of Open Elective Course-I

B.Tech. Computer Science and Engineering (Cyber Security) Scheme of Studies/Examination Semester - VI

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Computer Networks	3	0	0	3	30	70	100
2	PCC		Cyber for Data Science and its applications	3	0	0	3	30	70	100
3	PCC		Intrusion Detection Systems	3	0	0	3	30	70	100
4	PEC		Professional Elective –II	3	0	0	3	30	70	100
5	OEC		Open-Elective-II	3	0	0	3	30	70	100
	PEC		Professional Elective -III	3	0	0	3	30	70	100
7	LC		Computer Networks Lab (P)	0	0	2	1	50	50	100
8	LC		Cyber for Data Science and its applications Lab (P)	0	0	2	1	50	50	100
9	PROJ		Project-I	0	0	4	2	50	50	100
Total				18	0	8	22			900

NOTE:

1. At the end of the 6th semester, each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training center etc. and submit the typed report along with a certificate from the organization & its evaluation shall be carried out in the 7th Semester.
2. Choose any one from Professional Elective Course – II & III
3. Choose any one from Open Elective Course – II*

Professional Elective Course – II

1. Cyber Crimes and Laws
2. Database and Cloud Security
3. Malware Analysis and Reverse Engineering
4. Steganography & Digital Watermarking

Professional Elective Course – III

1. Software Testing and Project Management
2. Data Mining and Warehousing
3. Social network Analysis
4. Cryptocurrency with ethereum

***Open elective Course-II :** To be chosen from the bucket of Open Elective Course-II

**B.Tech. Computer Science and Engineering
(Cyber Security)
Scheme of Studies/Examination
Semester - VII**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Text and Web Intelligence	3	0	0	3	30	70	100
2	LC		Text and Web Intelligence (P)	0	0	2	1	50	50	100
3	PCC		Digital Forensics	3	0	0	3	30	70	100
4	PEC		Professional Elective-IV	3	0	0	3	30	70	100
5	OEC		Open Elective-III	3	0	0	3	30	70	100
6	OEC		Open Elective-IV	3	0	0	3	30	70	100
7	Project		Project-II	0	0	8	4	100	100	200
8	Training		Practical Training-II	0	0	2	1	50	50	100
Total				15	0	12	21			900

NOTE:

1. Choose any one from Professional Elective Course – IV
2. Choose any one from Open Elective Course – III & IV

Professional Elective Course – IV

1. Ethical Hacking
2. Information Security Risk Assessment
3. Wireless and Mobile security
4. Wireless sensor networks

* **Open Elective Course – III & IV** : To be chosen from the bucket of Open elective –III and IV respectively

**B.Tech. Computer Science and Engineering
(Cyber Security)
Scheme of Studies/Examination
Semester - VIII**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PROJ		Project III/Industrial Project	0	0	16	8	150	150	300
2			MOOC	3	0	0	3	30	70	100
3			MOOC	3	0	0	3	30	70	100
9										
Total				06		16	14	210	290	500

NOTE: At the end of the 8th semester, each student has to submit the certificate of MOOCs (Essential).

Chapter 3: Detailed Syllabus

B.Tech Computer Science and Engineering (Cyber Security) Scheme of Studies/Examination Semester I

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	HSMC		Communication Skills in English	2	0	0	2	30	70	100
3	BSC		Mathematics-I	3	1	0	4	30	70	100
4	ESC		Basic of Electrical and Electronics Engineering OR Physics	3 OR 3	0 OR 1	0 OR 0	3 OR 4	30 OR 30	70 OR 70	100 OR 100
5	ESC		Programming for problem solving using C	3	0	0	3	30	70	100
6	HSMC		Basics of Environmental Science	2	0	0	2	30	70	100
7	HSMC		Communication Skills in English (P).	0	0	2	1	50	50	100
8	ESC		Basic of Electrical and Electronics Engineering (P) OR Physics (P)	0 OR 0	0 OR 0	2 OR 2	1 OR 1	50 OR 50	50 OR 50	100 OR 100
9	ESC		Programming for problem solving using C (P)	0	0	2	1	50	50	100
10	ESC		Workshop Practices (P) OR Engineering Graphics (Web Designing)	1 OR 1	0 OR 0	3 OR 2	2.5 OR 2	50 OR 50	50 OR 50	100 OR 100
11	AU		Sports (Audit Course) Compulsory	0	0	2	0	0	0	0
Total				14	1	11	19.5			900

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

Course code	HSE-101				
Category	Humanities and Social Sciences				
Course title	Communication Skills in English				
Scheme and Credits	L	T	P	Credits	
	2	0	0	2	
Class work/ Practical	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OUTCOMES:

1. The course will focus on the four integral skills of language, improving the proficiency levels in all of them and to learn to use language as a tool for effective communication.
2. The course will focus on the four integral skills of language, improving the proficiency levels in all of them and to learn to use language as a tool for effective communication
3. This course will widen the understanding of the learners in all genres of literature (short stories, poetry, autobiographies.) with the help of expository pieces .
4. The course will strive to equip the learner with the ability to express oneself and be understood by others with clarity and precision, in both written and spoken forms.
5. This course will encourage creative use of language through translation, paraphrasing and paragraph writing.
6. Along with the above, the course will also build confidence and encourage the students to use a standard spoken form of English in order to prepare them to face job interviews, workplace and in higher studies.

UNIT-I

Remedial English : Parts of speech, Gerunds, Participles and infinitives; Clauses; Sentence constructions (unity; avoidance of choppy and rambling sentences, logic and consistency, conciseness, sequencing of ideas); Sentence errors-agreement between verb and subject, pronoun and antecedents, sequence of tenses, problems involving modifiers (dangling and misplaced modifiers); Shifts in point of view consistency of number and person, tense, mood, voice and subject; Parallelism; Omissions and mixed constructions.

UNIT-II

Vocabulary : Methods of building vocabulary-etmological roots, prefixes and suffixes; Commonly used foreign words and phrases; spelling; words often confused synonyms and homonyms; one word substitutes; verbal idioms.

UNIT-III

Punctuation and Mechanics: End Punctuation; internal Punctuation; Word Punctuation. Comprehension: Abstracting; Summarizing; Observation, Findings and Conclusions; Illustration and Inductive Logic; Deduction and Analogy.

UNIT-IV

Presentation: Oral presentation- Extempore, discussion on topics of contemporary relevance, Interviews. Written Comprehension: The ability to write after listening to and reading select speeches, news bulletins,

presentations and answering questions based on what has been heard. Reading the given texts to skim, scan, infer and answer comprehension questions. Reading texts like case studies and project reports for critical assessment and book Review.

Suggested Books:

1. Nitin Bhatnagar and Mamta Bhatnagar, Communicative English for Engineers and Professionals. Pearson Education.
2. Bhatnagar, k. Manmohan. Ed. The Spectrum of Life: An Anthology of Modern Prose. Delhi: Macmillan India Ltd., 2006.
- 3 C. Murlikrishna & Sunita Mishra, Communication Skills for Engineers, Pearson Ed.
- 4 Sinha, R.P. Current English Grammar and Usage. OUP.
5. Rizvi, M. Ashraf. Effective Technical Communication. McGraw Hill Education (India) Pvt. Ltd., 2014.
6. Eastwood, John. Oxford Guide to English Grammar. OUP, 2010.
7. Kumar, Sanjay and Pushp Lata. Communication Skills. OUP, 2011.
8. Raman, Meenakshi and Sangeeta Sharma. Communication Skills. New Delhi: OUP, 2011.
9. Hill, L.A. A Guide to Correct English. London: OUP, 1965.
10. Oxford Dictionary of English Idioms. New Delhi: OUP, 2009
- 11 *<http://yousigma.com/religionandphilosophy/swamivivekananda/thesecretofwork.pdf>

Course Code	BSM-101				
Category	Basic Science Course				
Course title	Mathematics-I				
Scheme and Credits	L	T	P	Credits	
	3	1	0	4	
Class work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES

1. To develop logical understanding of the subject
2. To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.
3. To make aware students about the importance and symbiosis between Mathematics and Engineering.

UNIT-I

Matrices: Matrices, Vectors: addition and scalar multiplication, Matrix multiplication, Linear systems of equations, Linear Independence, Rank of a matrix, Determinants, Cramer’s Rule, Inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

UNIT-II

Vector spaces I: Vector Space, Linear dependence of vectors, Basis, Dimension, Range and kernel, Rank and nullity, Inverse of a linear transformation, Rank nullity theorem,

UNIT-III

Vector spaces II: Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric and Orthogonal Matrices, Eigen bases, Diagonalization, Inner product spaces, Gram-Schmidt orthogonalization.

UNIT-IV

Calculus: Indeterminate forms and L' Hospital's rule, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems, Evaluation of definite and improper integrals, Applications of definite integrals to evaluate surface areas and volumes of revolutions, Beta and Gamma functions and their properties.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. D. Poole, Linear Algebra: A Modern Introduction, Brooks Cole.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Course code	BSP-101				
Category	Basic Science Course				
Course title	Physics				
Scheme and Credits	L	T	P	Credits	
	3	1	0	4	
Class work	30Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT - I

Review of Atomic Structure and Statistical Mechanics: - Ideas on Atomic Structure, Quantum Mechanics, The Schrodinger Wave Equation, Statistical Mechanics, Bonding of atoms, Crystalline state. Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT - II

Elemental and compound semiconductors, Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, The Hall Effect, Einstein Relations, Excess carriers in semiconductors p-n junction, Excess carriers and Quasi-Fermi Levels, Basic equations for semiconductor device operation, Solution of carrier transport equation.

UNIT - III

P-N Junctions: - The abrupt junction (Electric field, potential, capacitance), V-I characteristic of an ideal diode, a real diode. Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT - IV

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-Vis spectroscopy, absorption/transmission. Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Heterojunctions and associated band- diagram.

Suggested reference books

1. Pierret, Semiconductor Device Fundamental,
2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Pearson Education
3. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.
4. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc.
5. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley
6. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York.
7. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
8. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

Course code	EEE-101				
Category	Engineering Science Course				
Course title	Basics of Electrical and Electronics Engineering				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES

1. To provide basic knowledge of different elements of electrical and electronics engineering field.
2. To familiarize the students with the concepts of electrical circuits and network Analysis.
3. To understand the basics of AC and DC circuits.
4. To familiarize students to the analysis and design of analog electronic circuits which form the basic building blocks of almost any electronic system.

5. To introduce p-n junction theory, operation of the semiconductor devices and their use in basic electronic circuits.

UNIT-I

DC Circuits: Role and importance of circuits in Engineering, Concept of fields, charge, current, voltage, energy and their interrelationships. Electrical circuit elements (R, L and C), voltage and current sources (ideal & Controlled) series and parallel circuits, Network reduction: voltage and current division Kirchhoff current and voltage laws with their applications (Nodal and Mesh Analysis), Source transformation - star delta conversion. Superposition theorem, Thevenin and Norton Theorems, Millman, Substitution and Reciprocity theorem.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, average, peak and rms values, complex representation of impedance, phasor representation, complex power, real power, reactive power, apparent power, power factor and Energy, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Resonance; Introduction to three-phase circuits

UNIT-III

Introduction to p-n junction diode and its applications. Half wave & full wave rectifiers. Clipping and clamping circuits, Varactor, Varistor, Voltage Regulator

Bipolar junction transistors and its biasing BJT operation, BJT voltages and currents, CE, CB and CC characteristics, DC load line and bias point, base bias, emitter feedback bias, collector feedback bias, voltage divider bias, Thermal stability, biasing BJT switching circuits, transistor power dissipation and switching time, Testing of bipolar junction transistor with multi-meter, Reading datasheet of BJT.

UNIT-IV

Field Effect Devices: JFET : basic Operation and characteristics, drain and transfer characteristics, pinch off voltage, parameters of JFET: Transconductance (g_m), ac drain resistance (r_d), amplification factor (μ), Small Signal Model & Frequency Limitations. MOSFET: basic operation, depletion and enhancement type, pinch-off voltage, Shockley equation and Small Signal Model of MOSFET, MOS capacitor.

Suggested books:

1. E. Huges, "Electrical Technology", ELBS.
2. J. Millman and C. Halkias, Integrated Electronics, McGraw Hill, 2nd Edition, 2009.
3. M.M. Mano: Digital Logic Design, Phi.

Suggested reference books

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. V. Del Toro, "Principles of Electrical engineering", PHI.
3. A. Sedra and C. Smith, Microelectronic Circuits: Theory and Applications, Oxford University Press, 6th Edition, 2013.
4. Boylestad and Nashelsky, "Electronic Devices and Circuit Theory" Pearson publishers, 10th Edition
5. R.P. Jain: Modern Digital Electronics, Tmh.
6. Malvino and Leach, "Digital Principles and Applications", TMH publishers, 8th Edition
7. Tyagi M.S., "Introduction to Semiconductor Materials and Devices", John Wiley & Sons, 1993.

8. Basic Electrical Engineering, A.E. Fitzgerald , David Higginbotham 2009 , Arvin Gabel, Tata McGraw-Hill Publishing Company; 5thEdition.

Course code	CSE-101				
Category	Professional Core Course				
Course title	Programming for Problem Solving Using C				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT-I

Introduction to Programming: Idea of Algorithm: Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. C Programming: Keywords, Variables and Data Types: basic, derived and user defined, Type Conversions, Header Files, Basic Input and Output Functions and Statements, Compilation, Syntax and Logical Errors in compilation, Object and Executable Code, Storage Classes, Arithmetic Expressions and Precedence.

UNIT-II

Preprocessors, Conditional and Branching Statements, Loops/ Iterative Statements, Writing and evaluation of conditionals and consequent branching.

UNIT-III

Arrays (1-D, 2-D), Character Arrays and Strings, Arrays with Pointers, Functions (including using built in libraries), Parameter passing in functions, Call by Value, Call by Reference, Passing arrays to functions, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

UNIT-IV

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, Introduction to Dynamic Memory Allocation and its Methods, Structures, Union, Defining Structures and Array of Structures, File Handling.

Suggested Text Books:

1. Ajay Mittal, Programming in C, 'A Practical Approach', Pearson Education.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Yashavant Kanetkar, Let Us C, BPB Publication.
5. Gill, Nasib Singh: Computing Fundamentals and Programming in C, Khanna Book Publishing Company(Private) Limited, New Delhi

Suggested Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

Course code	ENV-101				
Category	Humanities and Social Sciences				
Course title	Basics of Environmental Science				
Scheme and Credits	L	T	P	Credits	
	2	0	0	2	
Class work/Practical	50Marks				
Exam	50Marks				
Total	100Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES:

1. To impart the knowledge and awareness for the environmental protection for real-time contribution during an execution of engineering practices in the society.

COURSE OUTCOMES:

1. To understand the basic concepts of environmental studies and natural resources.
2. To learn about the various eco-systems of nature.
3. To gain knowledge about different types of environmental pollutions and their control measures.
6. To acquire the knowledge about the various social aspects related to the environment.

UNIT-I

Environmental studies and Natural Resources: Definition, scope and importance of environmental studies.

Natural Resources: Renewable and non-renewable resources, and associated problems

- (a) Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.
- (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
- (c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- (d) Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers-pesticides problems, water logging, salinity.
- (e) Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

UNIT-II

Eco Systems: Concept of an eco-system, Structure and function of an eco-system, Producers, consumers, decomposers, Energy flow in the ecosystems, Ecological succession, Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following ecosystems:

- (a) Forest ecosystem
- (b) Grass land ecosystem
- (c) Desert ecosystem
- (d) Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT-III

Environmental Pollution: Definition, Causes, effects and control measures of;

- (a) Air pollution
- (b) Soil pollution

- (c) Marine pollution
- (d) Noise pollution
- (e) Nuclear hazards

Disaster management: Floods, earth quake, cyclone and landslides.

UNIT-IV

Social issues and the Environment: From unsustainable to sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management.

Environmental ethics: issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Environment protection Act, Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife protection Act, Forest conservation Act, Issues involved in enforcement of environmental legislations.

Recommended Books:

1. Textbook of Environmental studies, Erach Bharucha, UGC.
2. Fundamental concepts in Environmental Studies, D. D. Mishra, S Chand & Co Ltd.

Course code	HSE-101P				
Category	Humanities and Social Sciences				
Course title	Communication Skills in English (P)				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Class work/ Practical	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Communication Skills in English (P)

Lab Activity: The students will acquire basic proficiency in English with special emphasis on listening, comprehension and speaking skills both at social and professional platforms.

- (i) Listening comprehension
- (ii) Recognition of phonemes in International Phonetic Alphabet
- (iii) Self introduction and introduction of another person
- (iv) Conversation and dialogues in common everyday situations
- (v) Communication at work place (Standard phrases and sentences in various situations)
- (vi) Telephonic communication
- (vii) Speeches for special occasions (Welcome speeches, Introduction speeches, Felicitation speeches and Farewell speeches)
- (viii) Tag Questions
- (ix) Formal Presentations on literary texts prescribed in theory paper, Question Formation & Mock Press Conference

Course code	BSP-101P				
Category	Basic Science Course				
Course title	Physics (P)				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: At least 8 experiments are to be performed by the students.

List of Subject related Experiments:

1. To study the forward and reverse characteristics of P-N junction diode.
2. To study the characteristics of Solar cell and find out the fill factor..
3. To study the reverse characteristics of Zener diode and voltage regulation using Zener Diode.
4. To determine Planks constant using photocell.
5. To measure e/m of electron using helical method.
6. To find capacitance of condenser using fleshing and quenching experiment.
7. To find temperature co-efficient of platinum using Callender Griffith bridge.
8. To find out low resistance by Carry Foster bridge.
9. To find resistance of galvanometer by post office box.
10. To measure resistance using four probe method.
11. To compare the capacitance of two capacitors using De'Sauty Bridge.

Course code	EEE-101P				
Category	Engineering Science Course				
Course title	Basics of Electrical and Electronics Engineering (P)				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: At least 8 experiments are to be performed by the students.

List of Subject related Experiments:

1. Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross-sectional area of the conductor.
2. Verification of Ohm's Law, Kirchhoff current and voltage laws
3. Verification of temperature co-efficient of resistance: (i) Positive for Tungsten and Nichrome and (ii) Negative for carbon.
4. To measure DC voltage and current, AC voltage and current with multi-meter
5. To observe waveforms on oscilloscope, measure basic parameters amplitude and frequency of sine wave and square wave.
6. Obtain VI characteristics of semiconductor rectifier diode, LED, Photo-diode

7. To observe waveform at the output of half wave rectifier with and without filter capacitor.
8. To observe waveform at the output of full wave rectifier with and without filter capacitor.
9. To experimentally plot the input and output characteristics of a given BJT transistor in CE configuration and calculate its various parameters.
10. To experimentally plot the input and output characteristics of a given BJT transistor in CB configuration and calculate its various parameters.
11. To study the transfer and drain characteristics of JFET and calculate its various parameters.
12. To study the transfer and drain characteristics of MOSFET and calculate its various parameters.

Course code	CSE-101P				
Category	Professional Core Course				
Course title	Programming for Problem Solving Using C (P)				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: At least 6 experiments are to be performed by the students.

List of Subject related Experiments:

LABORATORY OUTCOMES

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Course code	CSE-103P				
Category	Engineering Science Course				
Course title	Engineering Graphics (Web Designing)				
Scheme and Credits	L	T	P	Credits	
	1	0	2	2	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

SYLLABUS

Brief history of Internet, introduction to world wide web, basic principles involved in developing a web site, rules of web designing, web standards, audience requirements, Design concept.

Introduction to elements of HTML, XHTML and CSS.

Javascript as programming language, Language Syntax: Data types, Values, Variables, Expressions and Operators. JavaScript Statements, loops, arrays, strings, methods, Defining and Invoking functions and their closure.

Introduction of Google Web Designer, Firefox, Wordpress, sublime text, Angular.JS, jQuery etc.

Note: At least 8 experiments are to be performed by the students.

Lab work

List of Subject related Experiments:

1. Prepare a survey document of ten website which you like and dislike with various reasons. (Prerequisite)
2. Introduction to basic HTML elements
3. Use table tag to format web page. Also create the Time Table of your class using table tag.
4. Create your profile page i.e. educational details, Hobbies, Achievement, My Ideals etc.
5. Create Style sheet to set formatting for text tags and embed that style sheet on web pages created for your site. Design a web page and embed various multimedia features in the page.
6. Design signup form to validate username, password, and phone numbers etc using Java script.

7. Write a JavaScript program to determine whether a given year is a leap year in the Gregorian calendar.
8. Write a JavaScript program to convert temperatures to and from celsius, Fahrenheit.
9. Installation of Wordpress and designing the wordpress site.
10. Introduction to Dreamweaver and setting up site using Dreamweaver.
11. Submission of Website with Report.

Course code	MEE-102P				
Category	Engineering Science Course				
Course title	Workshop Practices (P)				
Scheme and Credits	L	T	P	Credits	
	1	0	3	2.5	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES

1. To impart fundamental Knowledge of engineering practices such as fitting, wood working, foundry, machining, welding, etc. for manufacturing a product.
2. To prepare the students to understand the various tools and equipment's used in these processes and their working principle
3. To impart fundamental Knowledge of Lathe machine
4. To able to understand the basic knowledge of various welding processes

SYLLABUS

Introduction:

Introduction to Manufacturing Processes and their Classification, Introduction to additive manufacturing, Industrial Safety.

Machining Shop:

Lathe, description of lathe: headstock, tailstock, gearbox, carriage, apron, cutting speed, feed & depth of cut, cutting tools, Chucks: 3 jaw, 4 jaw.

Fitting shop:

Introduction, classification of metals: ferrous and nonferrous, fitting tools: measuring and marking tools, marking schemes for a fitting jobs, cutting tools.

Carpentry shop:

Introduction of carpentry, types of woods, carpentry tolls: measuring tools, marking tolls, cutting tools:

saws, chisels, planing tools, drilling tools, striking tools, wood working joints, wood working lathe.

Foundry Shop:

Introduction, foundry hand tools, measuring boxes, ladle, moulding, furnaces, Types of Pattern and Allowances

Welding Shop:

Introduction to welding, Classification of Welding Processes, Arc welding & Gas welding equipment's.

Reference Books:

1. S K Hajra Choudhury, Nirjhar Roy, A K Hajra Choudhury, Elements of workshop Technology (vol. 1&2), Media Promoters.
2. B S Raghuwanshi, A Course in Workshop Technology (manufacturing Process vol. 1& 2) Dhanpat Rai & CO.
3. O.P. Khanna, Workshop Technology. Dhanpat Rai Publication.
4. W A J Chapman, Workshop technology in SI unit (part – 1 &2), Mc Graw Hill Education.
5. M.P. GROOVER, Principles of Modern Manufacturing, Wiley.
6. Kalpakjian, Manufacturing Process for Engineering Materials, Pearson Education India.

Lab Work

List of Experiments

1. To study different types of measuring tools used in metrology and determine least counts of vernier callipers, micrometres and vernier height gauges.
2. To study different types of machine tools (lathe, shaper, planer, milling, drilling machines)
3. To prepare a job on a lathe involving like facing, outside turning, taper turning, step turning, radius making and parting-off.
4. To study different types of fitting tools and marking tools used in fitting practice.
5. To prepare a job made out of MS Flats, making saw – cut filling V-cut taper at the corners.
6. To prepare lay out on a metal sheet by making and prepare rectangular tray pipe shaped components e.g. funnel.
7. To prepare joints for welding suitable for butt welding and lap welding.
8. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
9. To prepare simple engineering components/shapes by forging.
10. To prepare mold and core assembly.
11. To prepare horizontal surface/vertical surface/curved surface/slats or V-grooves on a shaper/planner.
12. To prepare a job involving side and face milling on a milling
13. To prepare a job on CNC Machine/Additive Manufacturing.

Note : At least eight experiments/jobs are to be performed/prepared by the students in the semester.

**B.Tech. Computer Science and Engineering
(Cyber Security)
Scheme of Studies/Examination
Semester II**

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	BSC		Mathematics-II	3	1	0	4	30	70	100
3	HSMC		Human Value & Soft Skills	2	0	2	3	30	70	100
4	ESC		Basic of Electrical and Electronics Engineering OR Physics	3	0	0	3	30	70	100
				OR	OR	OR	OR	OR	OR	OR
				3	1	0	4	30	70	100
5	PCC		Data Structure Using C	3	0	0	3	30	70	100
6	PCC		Object Oriented Concepts and Python Programming	3	0	0	3	30	70	100
7	ESC		Basic of Electrical and Electronics Engineering (P) OR Physics (P)	0	0	2	1	50	50	100
				OR	OR	OR	OR	OR	OR	OR
				0	0	2	1	50	50	100
8	LC		Data Structure Using C (P)	0	0	2	1	50	50	100
9	LC		Object Oriented Concepts and Python Programming (P)	0	0	2	1	50	50	100
10	ESC		Workshop Practices (P) OR Engineering Graphics (Web Designing)	1	0	3	2.5	50	50	100
				OR	OR	OR	OR	OR	OR	OR
				1	0	2	2	50	50	100
Total				15	2	10	22			900

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students

Course Code	BSM-102				
Category	Basic Science Course				
Course title	Mathematics-II				
Scheme and Credits	L	T	P	Credits	
	3	1	0	4	
Class work	30Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES

1. Demonstrate their understanding of mathematical ideas from multiple perspectives.
2. To develop logical understanding of the subject
3. To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.
4. To make aware students about the importance and symbiosis between Mathematics and Engineering.

UNIT-I

Random variables and discrete probability distributions: Conditional probability, Probability spaces, Discrete random variables, Independent random variables, Expectation of discrete random variables, Sums of independent random variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality, The multinomial distribution, Poisson approximation to the binomial distribution, Infinite sequences of Bernoulli trials.

UNIT-II

Continuous and Bivariate probability distribution: Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities, Bivariate distributions and their properties, Distribution of sums and quotients, Conditional densities, Bayes' rule.

UNIT-III

Basic Statistics: Measures of Central tendency: Moments, Skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions; Correlation and regression – Rank correlation; Curve fitting by the method of least squares-fitting of straight lines, second degree parabolas and more general curves.

UNIT-IV

Applied Statistics: Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations; Small samples: Test for single mean, difference of means and correlation coefficients; Test for ratio of variances – Chi-square test for goodness of fit and independence of attributes

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
3. S. Ross, A First Course in Probability, Pearson Education.

4. W. Feller, An Introduction to Probability Theory and its Applications, Wiley.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill Publishing Company Limited.

Course code	HSV-102				
Category	Humanities and Social Sciences				
Course title	Human Values and Soft Skills				
Scheme and Credits	L	T	P	Credits	
	2	0	2	3	
Class work/Practical	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES

1. The course aims at developing the desired English language skills of students of Engineering and Technology so that they become proficient in communication to excel in their professional lives. The course has been designed as to enhance their linguistic and communicative competence.
2. Understanding (Clarity) of Human Relationships and Family.
3. Exposure to Issues in Society and nature (larger manmade systems and Nature).

UNIT-I

Motivation and Objectives of Human Values Course, Purpose of Education, Complimentarily of skills and values, how the current education system falls short, Peers Pressure, Social Pressure In various dimensions of life, Concept of Competition and Time Management.

UNIT-II

Concept of Preconditioning, Concept of Natural Acceptance in Human Being, Understanding Relationships, Dealing with anger, Nine universal values in human relationships. Concept of prosperity, idea of Society, Idea of decentralization of politics, economics, education, justice etc., Its comparison with centralized systems, Balance in nature.

UNIT-III

Techniques of Good Writing, Writing self-assessment tasks, Precis writing and note making. Paragraph and Essay writing, Article writing and summarizing

UNIT-IV

Business Communication: Formal and Informal Letter writing, Statement of Purpose, Job application & CV (summary statement of academic & professional profiles) and Power point presentations through relevant slides.

English Lab Activity: Blog Writing/Creating a Newsletter, Script writing & enacting for a street play. Develop negotiating skills by using appropriate language of courtesy, Recording individual efforts and holding paired interactions and Group Discussions, Preparing and practicing for Interviews.

Suggested reference books

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson Education, 2013.
2. Swan, Michael. Practical English Usage. OUP, 1995.
3. Gangal, J.K. Practical Course in Spoken English. New Delhi: PHI Learning, 2015.
4. Konar, Nira. Communication Skills for Professionals. New Delhi: PHI Learning Pvt. Ltd., 2009.
5. Bansal, R.K. and J.B. Harrison. Spoken English. Orient Longman, 1983.
6. Sharma, Sangeeta and Binod Mishra. Communication Skills for Engineers and Scientists. Delhi: PHI Learning Pvt. Ltd., 20.
7. Annie Leonard, `` The Story of Stuff,`` Free Press.
8. Mohandas Karamchand Gandhi,`` The Story of My Experiments with Truth,`` Beacon Press
9. J Krishnamurthy,`` On Education,`` Official repository
10. Hermann Hesse ,`` Siddhartha,`` Bantam Books.
11. On Education - The Mother Aurobindo Ashram Publication

Course code	EEE-101				
Category	Engineering Science Course				
Course title	Basics of Electrical and Electronics Engineering				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES

1. To provide basic knowledge of different elements of electrical and electronics engineering field.
2. To familiarize the students with the concepts of electrical circuits and network Analysis.
3. To understand the basics of AC and DC circuits.
4. To familiarize students to the analysis and design of analog electronic circuits which form the basic building blocks of almost any electronic system.
5. To introduce p-n junction theory, operation of the semiconductor devices and their use in basic electronic circuits.

UNIT-I

DC Circuits: Role and importance of circuits in Engineering, Concept of fields, charge, current, voltage, energy and their interrelationships. Electrical circuit elements (R, L and C), voltage and current sources(ideal & Controlled),series and parallel circuits, Network reduction: voltage and current division Kirchoff current and voltage laws with their applications (Nodal and Mesh Analysis), Source transformation - star delta conversion. Superposition theorem, Thevenin and Norton Theorems, Millman, Substitution and Reciprocity theorem.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, average, peak and rms values, complex representation of

impedance, phasor representation, complex power, real power, reactive power, apparent power, power factor and Energy, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Resonance; Introduction to three-phase circuits

UNIT-III

Introduction to p-n junction diode and its applications. Half wave & full wave rectifiers. Clipping and clamping circuits, Varactor, Varistor, Voltage Regulator

Bipolar junction transistors and its biasing BJT operation, BJT voltages and currents, CE, CB and CC characteristics, DC load line and bias point, base bias, emitter feedback bias, collector feedback bias, voltage divider bias, Thermal stability, biasing BJT switching circuits, transistor power dissipation and switching time, Testing of bipolar junction transistor with multi-meter, Reading datasheet of BJT.

UNIT-IV

Field Effect Devices: JFET : basic Operation and characteristics, drain and transfer characteristics, pinch off voltage, parameters of JFET: Transconductance (g_m), ac drain resistance (r_d), amplification factor (μ), Small Signal Model & Frequency Limitations. MOSFET: basic operation, depletion and enhancement type, pinch-off voltage, Shockley equation and Small Signal Model of MOSFET, MOS capacitor.

Suggested books:

1. E. Huges, "Electrical Technology", ELBS.
2. J. Millman and C. Halkias, Integrated Electronics, McGraw Hill, 2nd Edition, 2009.
3. M.M. Mano: Digital Logic Design, Phi.

Suggested reference books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. V. Del Toro, "Principles of Electrical engineering", PHI.
3. Sedra and C. Smith, Microelectronic Circuits: Theory and Applications, Oxford University Press, 6th Edition, 2013.
4. Boylestad and Nashelsky, "Electronic Devices and Circuit Theory" Pearson publishers, 10th Edition
5. R.P. Jain: Modern Digital Electronics, Tmh.
6. Malvino and Leach, "Digital Principles and Applications", TMH publishers, 8th Edition
7. Tyagi M.S., "Introduction to Semiconductor Materials and Devices", John Wiley & Sons, 1993.
8. Basic Electrical Engineering, A.E. Fitzgerald, David Higginbotham 2009, Arvin Gabel, Tata McGraw-Hill Publishing Company; 5th Edition.

Course code	BSP-101				
Category	Basic Science Course				
Course title	Physics				
Scheme and Credits	L	T	P	Credits	
	3	1	0	4	
Class work	30Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT – I

Review of Atomic Structure and Statistical Mechanics: - Ideas on Atomic Structure, Quantum Mechanics, The Schrodinger Wave Equation, Statistical Mechanics, Bonding of atoms, Crystalline state. Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT - II

Elemental and compound semiconductors, Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, The Hall Effect, Einstein Relations, Excess carriers in semiconductors p-n junction, Excess carriers and Quasi-Fermi Levels, Basic equations for semiconductor device operation, Solution of carrier transport equation.

UNIT - III

P-N Junctions: - The abrupt junction (Electric field, potential, capacitance), V-I characteristic of an ideal diode, a real diode. Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices. Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT - IV

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-Vis spectroscopy, absorption/transmission. Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Heterojunctions and associated band- diagram.

Suggested reference books

1. Pierret, Semiconductor Device Fundamental,
2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Pearson Education
3. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.
4. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc.
5. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley
6. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York.
7. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
8. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

Course code	CSE-102				
Category	Professional Core Course				
Course title	Data Structures Using C				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT-I

Introduction:

Fundamentals of pointers in C, pointer declaration, passing pointer to functions, pointers and arrays, dynamic memory allocation, Definition of Algorithm, Data Abstraction, Performance Analysis & Measurement, Files and related operations in C. Data Structures vs Data Types.

Searching and Sorting Techniques:

Searching techniques: Linear and Binary search, Sorting techniques: Selection, Bubble, Insertion, Merge sort, Quicksort, List and Table Sorting.

UNIT-II

Linear Data Structures- I

Arrays: Definition of array, Array storage, sparse arrays; Transpose, addition, and multiplication of sparse matrices, Stacks and Queues and their applications, expression evaluation, A mazing problem; multiple stacks and queues in an array, Application of stacks recursion polish expression and their compilation conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem.

UNIT-III

Linear Data Structures- II

Linked Lists; definition, allocation for stacks and queues. Examples of linked lists, polynomial addition, comparison of sequential and linked allocation of storage; inversion, concatenation & copying of the lists. Implementations in C language.

Doubly Linked List: Definition of circular and doubly linked list, header node, insertion and deletion, sparse matrix, representation using doubly linked lists. Examples for application of doubly linked lists; dynamic storage management; node structures, routines for allocation and

deallocation, generalized lists and recursive algorithms for copying and comparison of lists.

UNIT-IV

Non Linear Data Structures

Trees, Basic concepts and definitions of a tree and binary tree and associated terminology, Binary tree traversal techniques, Binary tree representation of trees, transformation of trees into binary trees, some more operations on binary trees, Binary Search Trees, Heaps and heapsort, threaded binary trees, Graphs: Representation of graphs and their traversal, Minimum cost Spanning Trees.

BOOKS:

1. Seymour Lipschutz: Data Structures with C, Schaum's outline by TMH
2. E Horowitz and S. Sahni: Fundamentals of Data Structures in C, Second Edition, Universities Press, Hyderabad.
3. R.B. Patel: Expert Data Structures in C, Khanna Publishers,2001.
4. R.L. Kruse: Data Structures & Program Design in C, PHI.
5. D.F. Knuth: The art of Computer Programming Vol 1, Narosa Publications,1985.
6. Byron S. Gottfried & J K Chhabra: Theory and Problems of Programming with C Language, Schaum Series, TMH,2005.

Course code	CSE- 104				
Category	Professional Core Course				
Course title	Object-Oriented and python programming				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

UNIT-I

The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages; Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation; Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tabseparated); String manipulations: subscript operator, indexing, slicing a string.

UNIT-II

Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries; Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments.

UNIT-III

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data

modeling; persistent storage of objects; Encapsulation, Information hiding Method, Signature, Classes and Instances, Review of Abstraction, inheritance, polymorphism, operator overloading (`_eq_`, `_str_`, etc); abstract classes; exception handling, try block

UNIT-IV

Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.

Reference Books

1. Phillips, Dusty. *Python 3 object-oriented programming: Build robust and maintainable software with object-oriented design patterns in Python 3.8*. Packt Publishing Ltd, 2018.
2. Steven F. Lott, *Mastering Object-Oriented Python - Second Edition*, published by Packt.
3. *Python Object Oriented Programming Cookbook*, published by Packt.
4. Mark Lutz, *Programming Python: Powerful Object-Oriented Programming*.
5. Irv Kalb, *Object-Oriented Python: Master OOP by Building Games and GUIs* Kindle Edition

Course code	EEE-101P				
Category	Engineering Science Course				
Course title	Basics of Electrical and Electronics Engineering (P)				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: At least 8 experiments are to be performed by the students.

List of Subject related Experiments:

1. Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross-sectional area of the conductor.
2. Verification of Ohm's Law, Kirchhoff current and voltage laws
3. Verification of temperature co-efficient of resistance: (i) Positive for Tungsten and Nichrome and (ii) Negative for carbon.
4. To measure DC voltage and current, AC voltage and current with multi-meter
5. To observe waveforms on oscilloscope, measure basic parameters amplitude and frequency of sine wave and square wave.
6. Obtain VI characteristics of semiconductor rectifier diode, LED, Photo-diode
7. To observe waveform at the output of half wave rectifier with and without filter capacitor.
8. To observe waveform at the output of full wave rectifier with and without filter capacitor.
9. To experimentally plot the input and output characteristics of a given BJT transistor in CE configuration and calculate its various parameters.
10. To experimentally plot the input and output characteristics of a given BJT transistor in

CB configuration and calculate its various parameters.

11. To study the transfer and drain characteristics of JFET and calculate its various parameters.
12. To study the transfer and drain characteristics of MOSFET and calculate its various parameters.

Course code	BSP-101P				
Category	Basic Science Course				
Course title	Physics (P)				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: At least 8 experiments are to be performed by the students.

List of Subject related Experiments:

1. To study the forward and reverse characteristics of P-N junction diode.
2. To study the characteristics of Solar cell and find out the fill factor..
3. To study the reverse characteristics of Zener diode and voltage regulation using Zener Diode.
4. To determine Planks constant using photocell.
5. To measure e/m of electron using helical method.
6. To find capacitance of condenser using fleshing and quenching experiment.
7. To find temperature co-efficient of platinum using Callender Griffith bridge.
8. To find out low resistance by Carry Foster bridge.
9. To find resistance of galvanometer by post office box.
10. To measure resistance using four probe methode.
11. To compare the capacitance of two capacitors using De'Sauty Bridge.

Course code	CSE-102P				
Category	Professional Core Course				
Course title	Data Structures Using C (P)				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: At least 8 experiments are to be performed by the students.

List of Subject related Experiments:

1. Write a program to search an element in a two-dimensional array using linear search.
2. Using iteration & recursion concepts write programs for finding the element in the array using Binary Search Method
3. Write a program to perform following operations on tables using functions only
(a) Addition (b) Subtraction (c) Multiplication (d) Transpose
4. Using iteration & recursion concepts write the programs for Quick Sort Technique
5. Write a program to implement the various operations on string such as length of string concatenation, reverse of a string & copy of a string to another.
6. Write a program for swapping of two numbers using ‘call by value’ and ‘call by reference strategies.
7. Write a program to implement binary search tree.
8. (Insertion and Deletion in Binary search Tree)
9. Write a program to create a linked list & perform operations such as insert, delete, update, reverse in the link list
10. Write the program for implementation of a file and performing operations such as insert, delete, update a record in the file.
11. Create a linked list and perform the following operations on it
(a) add a node (b) Delete a node

Course code	CSE-104P				
Category	Professional Core Course				
Course title	Object Oriented Concepts and Python Programming (P)				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Class work	50Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

List of Subject related Experiments:

1. Basic building blocks of a Python program (variables, conditional statements, loops, libraries, functions, errors).
2. Data structures (trees, dictionaries, tuples)
3. Object Oriented programming (classes, objects, inheritance, polymorphism, abstract classes).
4. PyQt for creating graphical user interfaces for interactive programs
5. NumPy (Matrices, vectors, linear algebra)
6. SciPy (Package for numerical computations)
7. Matplotlib (Plotting)
8. Interactive Python (IPython)

Course code	MEE-102P				
Category	Engineering Science Course				
Course title	Workshop Practices (P)				
Scheme and Credits	L	T	P	Credits	
	1	0	3	2.5	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES

1. To impart fundamental Knowledge of engineering practices such as fitting, wood working, foundry, machining, welding, etc. for manufacturing a product.
2. To prepare the students to understand the various tools and equipment's used in these processes and their working principle
3. To impart fundamental Knowledge of Lathe machine
4. To able to understand the basic knowledge of various welding processes

Class Work

Introduction:

Introduction to Manufacturing Processes and their Classification, Introduction to additive manufacturing, Industrial Safety.

Machining Shop

Lathe, description of lathe: headstock, tailstock, gearbox, carriage, apron, cutting speed, feed & depth of cut, cutting tools, Chucks: 3 jaw, 4 jaw.

Fitting shop:

Introduction, classification of metals: ferrous and nonferrous, fitting tools: measuring and marking tools, marking schemes for a fitting jobs, cutting tools.

Carpentry shop:

Introduction of carpentry, types of woods, carpentry tolls: measuring tools, marking tolls, cutting tools: saws, chisels, planning tools, drilling tools, striking tools, drilling tools, wood working joints, wood working lathe.

Foundry Shop

Introduction, foundry hand tools, measuring boxes, ladle, moulding, furnaces, Pattern: Types of Pattern

and Allowances

Welding Shop

Introduction to welding, Classification of Welding Processes, Arc welding & Gas welding equipment's.

Reference Books:

7. S K Hajra Choudhury, Nirjhar Roy, A K Hajra Choudhury, Elements of workshop Technology (vol. 1&2), Media Promoters.
8. B S Raghuwanshi, A Course in Workshop Technology (manufacturing Process vol. 1& 2) Dhanpat Rai & CO.
9. O.P. Khanna, Workshop Technology. Dhanpat Rai Publication.
10. W A J Chapman, Workshop technology in SI unit (part – 1 &2), Mc Graw Hill Education.
11. M.P. GROOVER, Principles of Modern Manufacturing, Wiley.
12. Kalpakjian, Manufacturing Process for Engineering Materials, Pearson Education India.

Lab Work

List of Experiments

1. To study different types of measuring tools used in metrology and determine least counts of vernier callipers, micrometres and vernier height gauges.
2. To study different types of machine tools (lathe, shaper, planer, milling, drilling machines)
3. To prepare a job on a lathe involving like facing, outside turning, taper turning, step turning, radius making and parting-off.
4. To study different types of fitting tools and marking tools used in fitting practice.
5. To prepare a job made out of MS Flats, making saw – cut filling V-cut taper at the corners.
6. To prepare lay out on a metal sheet by making and prepare rectangular tray pipe shaped components e.g. funnel.
7. To prepare joints for welding suitable for butt welding and lap welding.
8. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
9. To prepare simple engineering components/shapes by forging.
10. To prepare mold and core assembly.
11. To prepare horizontal surface/vertical surface/curved surface/slats or V-grooves on a shaper/planner.
12. To prepare a job involving side and face milling on a milling
13. To prepare a job on CNC Machine/Additive Manufacturing.

Note : At least eight experiments/jobs are to be performed/prepared by the students in the semester.

Course code	CSE-103P				
Category	Engineering Science Course				
Coursetitle	Engineering Graphics (Web Designing)				
Scheme and Credits	L	T	P	Credits	
	1	0	2	2	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Class work

Brief history of Internet, introduction to world wide web, basic principles involved in developing a web site, rules of web designing, web standards, audience requirements, Design concept.

Introduction to elements of HTML, XHTML and CSS.

Javascript as programming language, Language Syntax: Data types, Values, Variables, Expressions and Operators. JavaScript Statements, loops, arrays, strings, methods, Defining and Invoking functions and their closure.

Introduction of Google Web Designer, Firefox, Wordpress, sublime text, Angular.JS, jQuery etc.

Note: At least 8 experiments are to be performed by the students.

Lab work

List of Subject related Experiments:

1. Prepare a survey document of ten website which you like and dislike with various reasons. (Prerequisite)
2. Introduction to basic HTML elements
3. Use table tag to format web page. Also create the Time Table of your class using table tag.
4. Create your profile page i.e. educational details, Hobbies, Achievement, My Ideals etc.
5. Create Style sheet to set formatting for text tags and embed that style sheet on web pages created for your site.
6. Design a web page and embed various multimedia features in the page.
7. Design signup form to validate username, password, and phone numbers etc using Java script.
8. Write a JavaScript program to determine whether a given year is a leap year in the Gregorian calendar.
9. Write a JavaScript program to convert temperatures to and from celsius, Fahrenheit.
10. Installation of Wordpress and designing the wordpress site.
11. Introduction to Dreamweaver and setting up site using Dreamweaver.
12. Submission of Website with Report.

3rd

SEMESTER

**B.Tech. Computer Science and Engineering
(Cyber Security)
Scheme of Studies/Examination
Semester – III**

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	ESC		Digital Electronics	3	0	0	3	30	70	100
2	PCC		Introduction to Information Security	3	0	0	3	30	70	100
3	BSC		Discrete Mathematics	3	0	0	3	30	70	100
4	ESC		R Programming	3	0	0	3	30	70	100
5	PCC		Operating Systems	3	0	0	3	30	70	100
6	LC		Digital Electronics (P)	0	0	2	1	50	50	100
7	LC		Introduction to Information Security (P)	0	0	2	1	50	50	100
8	LC		R Programming (P)	0	0	2	1	50	50	100
9	LC		Operating Systems (P)	0	0	2	1	50	50	100
10	BSC		Aptitude Reasoning- I	3	0	0	3	30	70	100
Total				18	0	8	22			1000

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

DIGITAL ELECTRONICS

Semester	III				
Course code					
Category	Engineering Science courses				
Course title	Digital Electronics				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand the basic theoretical concepts of digital systems like the binary system and Boolean algebra.
2. To use Boolean algebraic formulations to design digital systems. To design using combinational/sequential circuits.
3. To express real-life problems in logic design terminology.
4. To understand the logic of adders, subtractors and converters.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Outline the general concepts and terminology related to logic gates, logic families, combinational and sequential circuits.

CO2: Discuss the basic analog/digital components and their interconnections in logic families and circuits.

CO3: Apply different methods/techniques to design various digital circuits.

CO4: Analyze day to day problems and industrial problems for their solutions using digital circuits.

CO5: Contrast different types of digital circuits and their designing methods.

CO6: Design digital circuit for various practical problems.

UNIT - I

FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems - binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT - II

COMBINATIONAL DIGITAL CIRCUITS

Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De- Multiplexer, Decoders, Adders, Subtractors, BCD arithmetic, carry look-ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT - III

SEQUENTIAL CIRCUITS AND SYSTEMS

A 1-bit memory, the circuit properties of the Bistable latch, the clocked SR flip-flop, J-K flip-flop, T flip-flop and D flip-flop, applications of flip-flops, shift registers, applications of shift registers, serial-to-parallel converter, parallel-to-serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip-flops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT - IV

A/D AND D/A CONVERTERS

Digital to analog converters: weighted resistor/converter, R-2-R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, Analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter.

TEXT AND REFERENCE BOOKS:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009
2. M. M. Mano, "Digital logic and Computer Design", Pearson Education India, 2016
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016
4. Nasib Singh Gill and J B Dixit, "Digital Design and Computer Organization", University Science Press, New Delhi

DISCRETE MATHEMATICS

Semester	III				
Course code					
Category	Basic Science courses				
Course title	Discrete Mathematics				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand the basic theoretical concepts of set theory, functions, and relations.
2. To understand the basic theoretical concepts of logic systems and Boolean algebra.
3. To express real-life problem of basic counting techniques and recurrence relations, algebraic structures.
4. The use of graphs theory concepts in real-life examples

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1: To solve mathematical problems based on concepts of set theory, relations, functions and lattices.
- CO2: To express logical sentences in terms of quantifiers and logical connectives.
- CO3: To apply basic counting techniques to solve permutation and combination problems.
- CO4: To solve recurrence relations.
- CO5: To classify the algebraic structure of any given mathematical problem.
- CO6: To evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
- CO7: To develop the given problem as graph networks and solve it with techniques of graph theory.

UNIT - I

SET THEORY, RELATIONS, FUNCTIONS, LOGIC AND PROPOSITIONAL CALCULUS

Set Theory: Introduction to set theory, Venn diagrams, Set operations, Algebra of sets, Duality, Finite and infinite sets, Counting principles, Power sets, Partitions, and Multi sets.

Relations: Cartesian product, Representation of relations, Types of relation, Binary relation, Equivalence relations, Partitions, Partial ordering relations, POSET, Hasse diagram, Lattices and its types.

Functions: Definition, Types of functions, Bijective functions, Composition of functions, Inverse functions, recursively defined functions, Finite and infinite sets, Countable and uncountable sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Logic And Propositional Calculus: Introduction, Propositions and compound propositions, Logical

operations, Propositions and truth tables, Tautologies, Contradictions, Logical equivalence, Algebra of propositions, Conditional and Bi-conditional statements, The use of Quantifiers.

UNIT - II

BASIC COUNTING TECHNIQUES AND RECURRENCE RELATION

Basic Counting Techniques: Pigeon-hole principle, Permutation and Combination, the Division algorithm: Prime Numbers, The GCD: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Recursion And Recurrence Relation: Polynomials and their evaluation, Sequences, Introduction to AP, GP and AG Series, Partial Fractions, Recurrence Relation, Linear Recurrence Relations with Constant Coefficients, Linear Homogeneous Recurrence Relations with Constant Coefficients, Particular Solution-Homogeneous Linear Difference Equations, Non-Homogeneous Linear Difference Equations, Total Solution, solving recurrence relation using generating functions.

UNIT - III

ALGEBRAIC STRUCTURES

Definitions and examples of Algebraic Structures with one Binary Operation: Semi Groups, Monoids, Groups, Semigroups, Subgroups, Abelian groups, Cosets, Normal Subgroup, Cyclic groups, Congruence Relation and Quotient Structures, Permutation Groups, Lagrange's Theorem, Homomorphism, Isomorphism, Automorphism.

Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Integral Domain, Fields; Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

UNIT - IV

GRAPHS THEORY: Introduction to graphs and their properties, Degree, Connectivity, Path, Cycle, Directed and undirected graphs, Subgraph, Bipartite Graphs, Regular Graphs, Connected Graphs, Multigraph and Weighted graph, Homomorphic and Isomorphic graphs, cut points and bridges, Paths and circuits, shortest path algorithm for weighted graphs, Eulerian paths and circuits, Hamiltonian path and circuits, Planar Graphs, Euler's formulae, Graph Colouring.

TEXT AND REFERENCE BOOKS:

1. Kenneth H. Rosen, *Discrete Mathematics and its Applications*, 6th Edition, Tata McGraw Hill, 2011.
2. Satinder Bal Gupta: *A Text Book of Discrete Mathematics and Structures*, University Science Press, Delhi.
3. C. L. Liu and D. P. Mohapatra, *Elements of Discrete Mathematics A Computer Oriented Approach*, Tata McGraw Hill, 3rd Edition, 2008.
4. J.P. Trembley and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill – 13th reprint, 2012.
5. Richard Johnsonbaugh, *Discrete Mathematics*, 6th Edition, Pearson Education Asia, 2011.
6. S. Lipschutz and M. Lipson, *Discrete Mathematics*, Tata McGraw Hill, 3rd Edition, 2010.
7. B. Kolman, R. C. Busby and S. C. Ross, *Discrete Mathematical structures*, 6th Edition, PHI, 2010.

INTRODUCTION TO INFORMATION SECURITY

Semester	III				
Course code					
Category	Professional Core course				
Course title	Introduction to Information Security				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Learning the basics and need of information security
2. Understanding moral and ethics of cyber security
3. Applying user authentication principles and access controls

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand the fundamentals of Information Security and Infrastructure

CO2: Illustrate and apply morals and ethics of cyber security

CO3: Interpret the concepts of cyber security in real-life

CO4: Understand different types of attacks and their applications

CO5: Study different access controls in cyber security

UNIT - I

INFORMATION SECURITY BASICS

What is Information Security, Goals of Information Security: Integrity Models, Availability Models, and Security is not just VAPT, Security Models: Security Model Work, Confidentiality, Integrity, and Availability (CIA) Triad, Real World Examples, Examples of Breach Incidents

UNIT - II

DOMAINS OF CYBER SECURITY

Domains of Cyber Security, Morals and Ethics, Cyber Law and Cyber Security: IT Act 2000 and Amendments, Social Engineering, Cyber Stalking, Botnets Attack Vector, Risk Analysis: Threat Vectors, Threat Sources and Targets, Types of Attacks: Malicious Mobile code, Advanced Persistent Threats (APTs), Manual Attacks

UNIT - III

USER AUTHENTICATION

Electronic User Authentication Principles, Password-Based Authentication, Token-Based Authentication, Biometric based Authentication, Remote User Authentication, Security issues for user authentication, Practical Applications (Iris biometric System), Case Study (Security Problems for ATM Systems)

UNIT - IV

ACCESS CONTROLS

Access Control: Access Control Principles, Subjects, Objects and access Rights, Discretionary Access Control (DAC), Mandatory Access Control (MAC), Role-based Access Control (RBAC), Attribute based Access Control, Identity, Credential and Access Management, Trust Frameworks, Case Studies

TEXT AND REFERENCE BOOKS:

1. Information Security: The Complete Reference by Mark Rhodes-Ousley
2. Computer Networking with Internet Protocols and Technology by William Stallings
3. Getting an Information Security Job for Dummies by Peter H. Gregory

Help Pages:

1. Breaking into InfoSec: A beginner's guide to all things Cyber Security

Web Sites:

1. VMware: <https://www.vmware.com/in.html>
2. VirtualBox: <https://www.virtualbox.org/>
3. Kali: <https://www.kali.org/downloads/> Web Tutorials
4. SANS: <https://www.sans.org/information-security/>
5. Geeksforgeeks: <https://www.geeksforgeeks.org/what-is-information-security/>

R PROGRAMMING

Semester	III			
Course code				
Category	Professional Core Course			
Course title	R Programming			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Understand the basics of R and different data types
2. Application of different operators and control statements
3. Analyzing data and understanding different statistics using R

COURSE OUTCOMES:

- CO1. Learn Fundamentals of R.
 CO2. Covers how to use different functions in R, how to read data into R, accessing R packages, writing, R functions, debugging, and organizing data using R functions.
 CO3. Cover the Basics of statistical data analysis with examples.
 CO4. To apply mathematical and statistical operations data structures in R
 CO5. To explain critical R programming language concepts such as control structures and recursion
 CO6. To demonstrate and implement basic R programming framework and data structures

UNIT - I

BASICS OF R

Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages- R Studio: R command Prompt, R script file, comments.

Handling Packages in R: Installing a R Package, Few commands to get started: installed. packages(), package. Description(), help(), find. Package(), library() - Input and Output – Entering Data from keyboard.

R - Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame.

R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables

UNIT - II

OPERATORS AND LOOPS

R - Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators.

R - Decision Making: if statement, if – else statement, if – else if statement, switch statement.

R - Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

R - Function: function definition, Built-in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values.

UNIT - III

DATA TYPES IN R

R – Strings: Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower().

R – Vectors: Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting.

R – List: Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector.

R – Matrices: Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division.

R - Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements.

R – Factors: creating factors, generating factor levels gl().

R - Data Frames: Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame,

Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast().

UNIT -IV

DATA VISUALIZATION

Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

Data Visualization through various plots and charts: bar charts, histogram, frequency polygon, density plots, scatter plots, box & whisker plots, heat and contour plots, plotting the above graphs in R, plotting with package ggplot2.

TEXT AND REFERENCE BOOKS

1. W. N. Venables, D. M. Smith and the R core Team, An introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics, version 3.3.2, 2016.
2. Saroj Dahiya Ratnoo and Himmat Singh Ratnoo, Essentials of R for Data Analytics, Wiley, 2021.
3. Hadley Wickham and Garrett Golemund, R for Data Science Import, Tidy, Transform and model Data, O'Reilly, 2017.
4. Paul Teeter, R Cookbook, O'Reilly, 2011.
5. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013.
6. Han, J., Kamber, M, Pei, J., Data Mining Concepts and Techniques, Third edition, Morgan Kaufmann, 2012.

OPERATING SYSTEMS

Semester	III				
Course code					
Category	Professional Core Course				
Course title	Operating Systems				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To learn the importance of operating system for Computer System.
2. To make aware of different types of Operating System and their services.
3. To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
4. To know virtual memory concepts.
5. To learn secondary memory management.

COURSE OUTCOMES:

- CO1. Understand the structure and architectural components of OS to analyze and design the applications to run in parallel. Moreover, students would be able to develop scheduling algorithms to optimize various parameters like CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time for research purpose.
- CO2. Understand the design issues associated with Operating system (e.g. Mutual exclusion, Deadlock detection etc.) to gain insight towards developing algorithms/techniques for efficient deadlock handling.
- CO3. For a given specification of memory organization, develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
- CO4. Design and implement file management system for a given specification.
- CO5. Identify, use and evaluate the disk management policies with respect to various performance evaluation parameters.

UNIT- I

INTRODUCTION: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services.

PROCESSES: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Multithreading.

PROCESS SCHEDULING: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Preemptive and Non-pre-emptive, FCFS, SJF, SRTF, RR Scheduling.

UNIT - II

INTER-PROCESS COMMUNICATION: Critical Section, Race Conditions, Mutual Exclusion, The Producer/Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC

Problems: Reader's & Writer Problem, Dining Philosopher Problem etc.

DEADLOCKS: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT- III

MEMORY MANAGEMENT: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

VIRTUAL MEMORY: Basics of Virtual Memory – Hardware and control structures –Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Optimal Page Replacement and Least Recently used (LRU).

UNIT-IV

FILE MANAGEMENT: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), efficiency and performance.

DISK MANAGEMENT: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

Case study on UNIX and WINDOWS Operating System.

TEXT AND REFERENCE BOOKS:

1. Operating System Concepts Essentials, 9th Edition by Avi Silberschatz,
2. Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
3. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
4. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
5. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
6. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
7. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates.

DIGITAL ELECTRONICS LAB

Semester	III				
Course code					
Category	Engineering Science courses				
Course title	Digital Electronics Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1. Implement the basic digital theory concepts practically and will be able to verify various results derived in theory.
- CO2. Design, analyze and troubleshoot broad range of combinational and sequential circuits for various practical problems using basic gates and flip flops I.C's.
- CO3. Develop technical writing skills to communication effectively and present one's own work.
- CO4. Acquire teamwork skills for finding sustainable solution of a complex problem and working effectively in groups

EXPERIMENTS

Implementation of all experiments with the help of Bread-Board.

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates; Realization of OR, AND, NOT and XOR functions using universal gates.
2. Half Adder / Full Adder: Realization using basic and XOR gates.
3. Half Subtractor / Full Subtractor: Realization using NAND gates.
4. 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter: Realization using XOR gates.
5. 4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips.
6. Multiplexer: Truth-table verification and realization of Half adder and Full adder.
7. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor.
8. Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF.
9. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter.
10. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter.
11. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations.
12. DAC Operation: Study of 8-bit DAC, obtain staircase waveform.
13. ADC Operations: Study of 8-bit ADC

INTRODUCTION TO INFORMATION SECURITY LAB

Semester	III				
Course code					
Category	Lab courses				
Course title	Information Security Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OUTCOMES:

- CO1. At the end of this course, students will demonstrate the ability to
- CO2. Apply commands of UNIX to perform different operations.
- CO3. Install different operating systems by using Virtual Box or other type.
- CO4. Apply different concepts of information security
- CO5. Acquire teamwork skills for investigating case studies and its application on other real-life problems.
- CO6. Analyze different ways of security measures for securing data, documents, passwords.

EXPERIMENTS

1. Installation of Different types of OS file installation: Linux, Windows (ova/ovf/iso image)
2. Study different real case studies on Confidentiality (Encryption, Steganography)
3. Case studies on Integrity (Hash, Checksum etc.), Availability (Backups)
4. Various Case Studies on Cyber Crimes and IT Act.
5. Study of steps to protect your personal computer system by creating User Accounts with Passwords and types of User Accounts for safety and security.
6. Study the steps to protect a Microsoft Word Document of different version with different operating system.
7. Study the steps to remove Passwords from Microsoft Word
8. Study various methods of protecting and securing databases.
9. Study “How to make strong passwords” and “passwords cracking techniques”.
10. Study the steps to hack a strong password.

R PROGRAMMING LAB

Semester	III				
Course code					
Category	Lab courses				
Course title	R Programming Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

The objective of R programming lab is to cover:

1. The basics of statistical computing and data analysis
2. How to use R for analytical programming
3. How to implement data structure in R
4. R loop functions and debugging tools
5. Writing custom R functions

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understanding the types, classes and functions of R Programming.

CO2: Accessing and Processing of Data.

CO3: Understanding the I/O interface programming.

CO4: Study and Analyse Data Visualisation.

CO5: Implement any application level simulation using R.

EXPERIMENTS

1. Write a R program to take input from the user (name and age) and display the values.
2. Write a R program to get the details of the objects in memory.
3. Creating a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
4. Creating a simple bar plot of five subjects marks.
5. Get the unique elements of a string and unique numbers of vectors
6. Appending value to a given empty vector
7. Multiplying two vectors of integer type and length 3
8. Find the sum, mean and product of a vector, ignoring elements like NA and NaN.
9. To create three vectors a,b,c with 3 integers. Combine three vectors to become a 3*3 matrix where each column represents a vector. Print the content of the matrix
10. Program to create a matrix from a list of given vectors

OPERATING SYSTEMS LAB

Semester	III				
Course code					
Category	Lab courses				
Course title	Operating Systems Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

1. To introduce Basic Unix general purpose Commands
2. To learn network Unix commands.
3. To learn shell script
4. To learn different programming language in Unix editor environment and implement different Operating system algorithm
5. To learn about file management and different types of permission setup.
6. To understand how system processes work and how to manage them

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1. Experiment with Unix commands and shell programming.

CO2. Able to build shell program for process and file system management with system calls.

CO3. Able to implement and analyse the performance of different algorithm of Operating Systems like CPU scheduling algorithm,

CO4. Able to implement and analyse the performance of different algorithm of page replacement algorithms, deadlock avoidance, detection algorithm and so on.

CO5. Able to design and develop a course project that can have positive impact on environment or society or mankind.

EXPERIMENTS

1. Basics of UNIX
2. UNIX commands
3. Implementation of FCFS and SJF CPU scheduling algorithms
4. Implementation of Round Robin and Priority CPU Scheduling
5. Implementation of Producer-Consumer problem using semaphores
6. Implementation of Dining Philosophers Problem
7. Implementation of FIFO Page Replacement Algorithms
8. Implementation of LRU Page Replacement Algorithms
9. Implementation of Sequential File Allocation Strategies
10. Implementation of Indexed File Allocation Strategies

APTITUDE REASONING - I

Semester	III			
Course code				
Category	BSC			
Course title	Aptitude Reasoning- I			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

COURSE OBJECTIVES:

This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.

COURSE OUTCOMES:

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

- CO1. Understand the basic concepts of quantitative ability
- CO2. Understand the basic concepts of logical reasoning Skills
- CO3. Acquire satisfactory competency in use of reasoning
- CO4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability
- CO5. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

UNIT - I

Quantitative Ability (Basic Mathematics). Number Systems, LCM and HCF , Decimal Fractions, Simplification, Square Roots and Cube Roots, Discount

UNIT - II

Quantitative Ability (Applied & Engineering Mathematics) Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Area, Height and Distance

UNIT - III

Data Interpretation. Data Interpretation, Tables, Column Graphs, Bar Graphs, Line Charts

UNIT - IV

Logical Reasoning (Deductive Reasoning): Analogy, Blood Relation, Directional Sense, Number and Letter Series, Clocks,

TEXT AND REFERENCE BOOKS

1. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
2. Analytical and Logical reasoning By Sijwali B S
3. Quantitative aptitude for Competitive examination By R S Agarwal
4. Analytical and Logical reasoning for CAT and other management entrance test By Sijwali B S
5. Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4 th edition

4th

SEMESTER

B.Tech. Computer Science and Engineering (Cyber Security) Scheme of Studies/Examination

Semester - IV

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	BSC		Aptitude Reasoning -II	3	0	0	3	30	70	100
2	PCC		Computer Architecture and Organization	3	0	0	3	30	70	100
3	PCC		Analysis and Design of Algorithms	3	0	0	3	30	70	100
4	PCC		AI Data Analytics using R	3	0	0	3	30	70	100
5	PCC		Cryptography and Security	3	0	0	3	30	70	100
6	PCC		Soft Computing	3	0	0	3	30	70	100
7	LC		Cryptography and Security Lab (P)	0	0	2	1	50	50	100
8	LC		Analysis and Design of Algorithms Lab (P)	0	0	2	1	50	50	100
9	LC		AI Data Analytics using R Lab (P)	0	0	2	1	50	50	100
10	AU		Indian Constitution*	2	0	0	0	Refer Note		
Total				21	0	6	24			900

***NOTE:** The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

APTITUDE REASONING-II

Semester	IV				
Course code					
Category	PCC				
Course title	Aptitude Reasoning-II				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.

COURSE OUTCOMES:

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

- CO1. Understand the basic concepts of quantitative ability
- CO2. Understand the basic concepts of logical reasoning Skills
- CO3. Acquire satisfactory competency in use of reasoning
- CO4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability
- CO5. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

UNIT - I

Quantitative Ability I . Average, Problems on Ages, Surds & Indices, Percentages, Problems on Numbers,

UNIT - II

Quantitative Ability II. Logarithm, Permutation and Combinations, Probability, Time & Work, Ratio and Proportion, Mixtures and Allegation, Volume, Problem on boat and stream

UNIT - III

Data Interpretation. Data Interpretation, Pie Chart, Venn Diagrams

UNIT - IV

Logical Reasoning (Deductive Reasoning) Coding – Decoding, Calendars, Venn Diagrams, Seating Arrangement, Syllogism, Mathematical Operations

TEXT AND REFERENCE BOOKS:

1. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
2. Analytical and Logical reasoning By Sijwali B S
3. Quantitative aptitude for Competitive examination By R S Agarwal
4. Analytical and Logical reasoning for CAT and other management entrance test By Sijwali B S
5. Quantitative Aptitude by Competitive Examinations by Abhijit Guha

COMPUTER ARCHITECTURE AND ORGANIZATION

Semester	IV				
Course code					
Category	PCC				
Course title	Computer Architecture and Organization				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

The objectives of the course are:

1. Discuss the basic concepts and structure of computers.
2. Understand concepts of register transfer logic and arithmetic operations.
3. Explain different types of addressing modes and memory organization.
4. Learn the different types of serial communication techniques.
5. Summarize the Instruction execution stages.

COURSE OUTCOMES:

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

- CO1. Understand the theory and architecture of central processing unit.
- CO2. Analyze some of the design issues in terms of speed, technology, cost, performance.
- CO3. Design a simple CPU with applying the theory concepts.
- CO4. Use appropriate tools to design verify and test the CPU architecture.
- CO5. Learn the concepts of parallel processing, pipelining and interprocessor communication.
- CO6. Understand the architecture and functionality of central processing unit.
- CO7. Exemplify in a better way the I/O and memory organization.
- CO8. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

UNIT-I

BOOLEAN ALGEBRA AND LOGIC GATES

Boolean algebra and Logic gates, Combinational logic blocks(Adders, Multiplexers, Encoders, decoder), Sequential logic blocks(Latches, Flip-Flops, Registers, Counters) Store program control concept, Flynn's classification of computers (SISD, MISD, MIMD); Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language; structured organization; CPU, caches, main memory, secondary memory units & I/O; Performance metrics; MIPS, MFLOPS.

UNIT -II

INSTRUCTION SET ARCHITECTURE

Instruction Set Architecture Instruction set based classification of processors (RISC, CISC, and their comparison); addressing modes: register, immediate, direct, indirect, indexed; Operations in the instruction set; Arithmetic and Logical, Data Transfer, Control Flow; Instruction set formats (fixed, variable, hybrid); Language of the machine: 8086; simulation using MSAM.

UNIT -III

MEMORY HIERARCHY

Basic non pipelined CPU Architecture and Memory Hierarchy & I/O Techniques CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, Fetch-Decode-Execute cycle (typically 3 to 5 stage); microinstruction sequencing, implementation of control unit, Enhancing performance with pipelining. The need for a memory hierarchy (Locality of reference principle, Memory hierarchy in practice: Cache, main memory and secondary memory, Memory parameters: access/ cycle time, cost per bit); Main memory (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types); Cache memory (Associative & direct mapped cache organizations).

UNIT- IV

PARALLELISM AND INTERRUPTS

Introduction to Parallelism and Computer Organization [80x86] Goals of parallelism (Exploitation of concurrency, throughput enhancement); Amdahl's law; Instruction level parallelism (pipelining, super scaling –basic features); Processor level parallelism (Multiprocessor systems overview). Instruction codes, computer register, computer instructions, timing and control, instruction cycle, type of instructions, memory reference, register reference. I/O reference, Basics of Logic Design, accumulator logic, Control memory, address sequencing, micro-instruction formats, micro-program sequencer, Stack Organization, Instruction Formats, Types of interrupts; Memory Hierarchy.

TEXT AND REFERENCE BOOKS:

1. Computer Organization and Design, 2nd Ed., by David A. Patterson and John L. Hennessy, Morgan 1997, Kauffmann.
2. Computer Architecture and Organization, 3rd Edi, by John P. Hayes, 1998, TMH.
3. Operating Systems Internals and Design Principles by William Stallings, 4th edition, 2001, Prentice-Hall Upper Saddle River, New Jersey
4. Computer Organization, 5th Edi, by Carl Hamacher, Zvonko Vranesic, 2002, Safwat Zaky.
5. Structured Computer Organisation by A.S. Tanenbaum, 4th edition, Prentice-Hall of India, 1999, Eastern Economic Edition.
6. Computer Organisation & Architecture: Designing for performance by W. Stallings, 4th edition, 1996, Prentice-Hall International edition.
7. Computer System Architecture by M. Mano, 2001, Prentice-Hall. 6. Computer Architecture- Nicholas Carter, 2002, T.M.H.

ANALYSIS AND DESIGN OF ALGORITHMS

Semester	IV				
Course code					
Category	PCC				
Course title	Analysis and Design of Algorithms				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. The students should be able to analyze various algorithms mainly for time and space complexity.
2. They should be able to develop algorithm for solving various computational problems by applying various algorithm design strategies.
3. They should be able to understand the effect of choice of data structures on the complexity of algorithm.

COURSE OUTCOMES:

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

- CO1: Apply the best data structure for designing an algorithm to solve a given problem.
CO2: Evaluate different algorithms with respect to time and space complexity.
CO3: Create algorithms to solve various computational problems.
CO4: Understand different complexity classes.
CO5: Understand the sorting techniques
CO6: Explain the hardness of real world problems with respect to algorithmic efficiency and learning to cope with it.

UNIT-I

BASIC CONCEPTS OF ALGORITHMS:

Basic Concepts of Algorithms: Notion of Algorithm, Fundamentals of Algorithmic Solving, Important problem types, Fundamentals of the Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical analysis of non-recursive algorithms. Mathematical analysis of recursive algorithm: recurrence relations, solution of recurrence relations using substitution method

UNIT-II

SORTING ALGORITHMS:

Brute Force, Divide and Conquer Strategy: Selection sort, Bubble sort, Sequential searching (Linear Search), Brute force string matching, General method, Merge sort, Quick Sort, Binary Search, Strassen's matrix multiplication

UNIT-III

GREEDY AND DYNAMIC PROGRAMMING:

Greedy Approach and Dynamic Programming: Fractional Knapsack problem, Minimum cost spanning tree: Prim's and Kruskal's algorithm, Single source shortest path problem, Principle of optimality, Multi-stage graph problem, all pair shortest path problem, 0/1 Knapsack problem, Traveling salesperson problem

UNIT-IV

BACKTRACKING & BRANCH AND BOUND:

Backtracking and Branch and Bound: General method backtracking, N-Queen problem, 0/1 Knapsack problem, General method of branch & bound, 0/1 Knapsack problem, Traveling sales person problem

Lower Bound Theory and Complexity Classes, Lower bounds, Decision trees, P, NP and NP Complete problems

TEXT BOOKS AND REFERENCE BOOKS:

1. Algorithm Design, Jon Kleinberg and Eva Tardos, 1st Edition, Pearson Education 2014.
2. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Book Publishing 2018.
3. Fundamentals of algorithms, Horowitz E, Sahini S, Rajasekaran S., University Press 2008.
4. Introduction to algorithms, Cormen, Leiserson, Rivest, Stein, 3rd Edition, PHI. 2012
5. An introduction to analysis of algorithms, R. Sedgewick, 1st edition, Pearson Education 1996.
6. Data Structures and Program Design in C By Robert L. Kruse, C.L. Tondo, Bruce Leung, Pearson Education. 2007.

AI DATA ANALYTICS USING R

Semester	IV				
Course code					
Category	PCC				
Course title	AI Data Analytics using R				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. In this course students will learn the basic concepts of data analysis
2. Perform data analytics, data visualisation and statistical model for data analytics.

COURSE OUTCOMES:

After completing this course, you will be able to:

- CO1: Explain critical R programming concepts
- CO2: Demonstrate how to install and configure RStudio
- CO3: Explain the use of data structure and loop functions
- CO4: Analyse data and generate reports based on the data
- CO5: Apply various concepts to write programs in R
- CO6: Understand different visualization techniques and applications using R
- CO7: Analyze the statistical data using R

UNIT-I

INTRODUCTION TO DATA ANALYSIS:

Overview of Data Analytics, Need of Data Analytics, Nature of Data, Classification of Data: Structured, Semi-Structured, Unstructured, Characteristics of Data, Applications of Data Analytics.

UNIT-II

R PROGRAMMING BASICS:

Overview of R programming, Environment setup with R Studio, R Commands, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors, Functions, R packages.

UNIT-III

DATA VISUALIZATION USING R:

Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Boxplots, Bar Charts, Line Graphs, Scatterplots, Pie Charts

UNIT-IV

STATISTICS WITH R:

Random Forest, Decision Tree, Normal and Binomial distributions, Time Series Analysis, Linear and Multiple Regression, Logistic Regression,

Prescriptive Analytics: Creating data for analytics through designed experiments, Creating data for analytics through active learning, Creating data for analytics through reinforcement learning

TEXT AND REFERENCE BOOKS:

1. An Introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics. W. N. Venables, D.M. Smith and the R Development Core Team. Version 3.0.1 (2013-05-16).

URL: <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>

2. Jared P Lander, R for everyone: advanced analytics and graphics, Pearson Education, 2013.
3. Dunlop, Dorothy D., and Ajit C. Tamhane. Statistics and data analysis: from elementary to intermediate. Prentice Hall, 2000.
4. G Casella and R.L. Berger, Statistical Inference, Thomson Learning 2002.
5. P. Dalgaard. Introductory Statistics with R, 2nd Edition. (Springer 2008)
6. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
7. Hastie, Trevor, et al. The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
8. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010
9. Joseph F Hair, William C Black et al , "Multivariate Data Analysis" , Pearson Education, 7th edition, 2013.
10. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.
11. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.

CRYPTOGRAPHY AND SECURITY

Semester	IV				
Course code					
Category	PCC				
Course title	CRYPTOGRAPHY AND SECURITY				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand basics of Cryptography and Network Security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. To understand various protocols for network security to protect against the threats in the networks.

COURSE OUTCOMES:

After the completion of the course the students will be able

- CO1. Discover all the Information Security Goals, Services & Mechanism for Network Security & necessity of Mathematics in designing crypto algorithms.
- CO2. Develop and design various kinds of Symmetric Key crypto algorithms and to cryptanalyze them.
- CO3. Construct and design various kinds of Asymmetric key crypto algorithms and Mathematics required for designing.
- CO4. Analyze the integrity of information transmitted & to generate digital signatures.
- CO5. Predict and apply the knowledge and skills obtained to design & understand latest cryptographic protocols used for securing information in networks or in storage.

UNIT-I

INTRODUCTION TO INFORMATION SECURITY & CRYPTOGRAPHY:

What is Information Security, Need for security, Principles of Security, Threats, Types of Attacks, Services & Mechanisms, Mathematics of Cryptography: Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence

UNIT-II

SYMMETRIC KEY CIPHERS:

Traditional Symmetric –Key Cipher design and analysis-Different Substitution ciphers & Transposition ciphers, Basic Principles of designing Stream cipher & Block cipher.

Mathematics of Symmetric-Key Cryptography-Algebraic Structures, GF (2n) Fields.

Modern Symmetric key Ciphers- Block Ciphers Design & Analysis - Data encryption Standard(DES), Advanced Encryption Standard (AES)

Stream Ciphers Design & Analysis-LFSR based, RC4, A5/1.

UNIT-III

ASYMMETRIC KEY CIPHERS, HASH FUNCTIONS AND DIGITAL SIGNATURES:

Mathematics of Asymmetric-Key Cryptography, Asymmetric key Ciphers, Hash Functions and MAC,

UNIT-IV

NETWORK SECURITY:

Network Security: Security at application layer – PGP & S/MIME, Key distribution Centre, Diffie-Hellman Key Exchange.

TEXT AND REFERENCE BOOKS:

1. Cryptography and Network Security 7th Edition, William Stallings
2. Cryptography and Network Security, 4th edition, Forouzan & Mukopadhyay, TMH.
3. Information Security & Cryptography-Cryptography Made Simple, Nigel P Smart, Springer Verlag, 2016.
4. Cryptography & Network Security, 2nd Edition, Atul Kahate. McGrawHill

SOFT COMPUTING

Semester	IV				
Course code					
Category	Professional Core Course				
Course title	Soft Computing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. To implement soft computing based solutions for real-world problems.
3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
4. To provide students; hand-on experience on MATLAB to implement various strategies.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Identify and describe soft computing techniques and their roles in building intelligent Machines.

CO2: Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.

CO3: Apply genetic algorithms to combinatorial optimization problems.

CO4: Evaluate and compare solutions by various soft computing approaches for a given problem.

UNIT - I

INTRODUCTION TO SOFT COMPUTING: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

UNIT - II

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT - III

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT - IV

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

TEXT AND REFERENCE BOOKS:

1. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", PHI
2. Satish Kumar, "Neural Networks: A classroom approach" Tata McGraw Hill.
3. Haykin S., "Neural Networks-A Comprehensive Foundations", PHI
4. Anderson J.A., "An Introduction to Neural Networks", PHI
5. M.Ganesh, "Introduction to Fuzzy sets and Fuzzy Logic" PHI.
6. N P Padhy and S P Simon, "Soft Computing with MATLAB Programming", Oxford University Press

CRYPTOGRAPHY AND SECURITY LAB

Semester	IV				
Course code					
Category	Lab courses				
Course title	Cryptography and Security Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

1. To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
2. To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
3. To familiarize symmetric and asymmetric cryptography

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1: Identify basic security attacks and services
- CO2: Use symmetric and asymmetric key algorithms for cryptography
- CO3: Make use of Authentication functions
- CO4: Implement different encryption and decryption algorithms
- CO5: Implement key expansion algorithms

EXPERIMENTS

1. Program to find GCD of any two numbers a and b mod n by Generalized Euclidean Algorithm
2. Program to find Multiplicative Inverse of b in Z_p , p prime by Generalized Euclidean Algorithm
3. Program to encrypt and decrypt by Ceaser Cipher
4. Program to Encrypt and Decrypt by Affine Cipher
5. Program to encrypt plaintext by Playfair Cipher
6. Program to generate addition and multiplication table for $GF(2^2)$ Field
7. Program for key expansion algorithm of DES
8. Program to implement 4×4 S-box and perform two functionalities:
 - a.) Check given table of S-box and inverse S-box are invertible to each other.
 - b.) Ask the user to enter input to be given in S-box and return its output.
9. Program to implement encryption and decryption of RSA algorithm

ANALYSIS AND DESIGN OF ALGORITHMS LAB

Semester	IV			
Course code				
Category	Lab courses			
Course title	Analysis and Design of Algorithms Lab			
Scheme and Credits	L	T	P	Credits
	0	0	2	1
Classwork	50 Marks			
Exam	50 Marks			
Total	100 Marks			
Duration of Exam	02 Hours			

COURSE OBJECTIVES:

The course should enable the students to:

1. Learn how to analyze a problem and design the solution for the problem.
2. Design and implement efficient algorithms for a specified application.
3. Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Design algorithms using divide and conquer, greedy and dynamic programming.

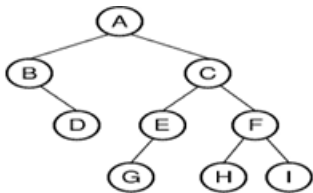
CO2: Execute sorting algorithms such as sorting, graph related and combinatorial algorithm in a high level language.

CO3: Analyze the performance of merge sort and quick sort algorithms using divide and conquer technique.

CO4: Apply the dynamic programming technique to solve real world problems such as knapsack and TSP.

EXPERIMENTS

1. Write a program to implement different sorting techniques.
 - Bubble Sort
 - Insertion Sort
 - Selection Sort
 - Quick Sort
 - Merge Sort
2. Write a program to find minimum cost spanning tree.
3. Write a program to implement travelling sales person problem.
4. Write a program to find Longest Path in a Directed Acyclic Graph.
5. Write a program for Shortest path with exactly k edges in a directed and weighted graph.
6. Write a program find maximum number of edge disjoint paths between two vertices
7. Implement 0/1 Knapsack problem using Dynamic Programming.
8. Perform various tree traversal algorithms for a given tree.



9. Implement N-Queens Problem

AI DATA ANALYTICS USING R LAB

Semester	IV				
Course code					
Category	Lab courses				
Course title	AI Data Analytics using R Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

The course should enable the students to:

1. Implement functions, analyze different datasets using R
2. Perform statistical analysis of data using R
3. Learn different visualization techniques

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1. Apply mathematical functions and build applications using R
- CO2. Analyze different datasets using R
- CO3. Visualize different parameters and interpret data
- CO4. Finding relationships between variables involved using different regression models
- CO5. Visualizing data using different plotting techniques

EXPERIMENTS

1. 1 R AS CALCULATOR APPLICATION

- a) Using with and without R objects on console
- b) Using mathematical functions on console
- c) Write an R script, to create R objects for calculator application and save in a specified location in disk.

2 DESCRIPTIVE STATISTICS IN R

- a) Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars & cars datasets.
- b) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.

3 READING AND WRITING DIFFERENT TYPES OF DATASETS

- a) Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location.
- b) Reading Excel data sheet in R.
- c) Reading XML dataset in R.

4. VISUALIZATIONS

- a) Find the data distributions using box and scatter plot.
- b) Find the outliers using plot.
- c) Plot the histogram, bar chart and pie chart on sample data.

5. REGRESSION MODEL

Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).

6. REGRESSION MODEL FOR PREDICTION

Apply regression Model techniques to predict the data on above dataset.

INDIAN CONSTITUTION

Semester	IV				
Course code					
Category	Audit Course				
Course title	Indian Constitution				
Scheme and Credits	L	T	P	Credits	
	2	0	0	0	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to a revolution in India.
- CO3: Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- CO4: Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I

PHILOSOPHY OF INDIAN CONSTITUTION: Salient features of Indian Constitution, Preamble, and Nature of Indian Constitution, Procedure for amendment of the Constitution.

UNIT-II

FEDERAL STRUCTURE: Federal structure and distribution of legislative and financial powers between the Union and the States

UNIT-III

ORGANS OF GOVERNANCE: President – Qualification and Powers of the President, Governor- Qualification and Powers of Governor,

PARLIAMENT: Composition, Qualifications and Disqualifications, Judiciary: Appointment, Tenure and Removal of Judges.

UNIT-IV

FUNDAMENTAL RIGHTS: Origin and development of Fundamental rights, Need for fundamental rights. Introduction to Rights to equality, right to freedom, right against exploitation, Right to freedom of religion, Cultural and Education rights and Fundamental duties.

TEXT AND REFERENCE BOOKS:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S.N. Busi, Dr. B.R. Ambedkar framing of Indian Constitution, latest Edition
3. M.P. Jain, Indian Constitution Law, Lexis Nexis, latest edition
4. D.D. Basu, Introduction to Constitution of India, Lexis Nexis, latest edition.

5th

SEMESTER

B.Tech. Computer Science and Engineering (Cyber Security)

Scheme of Studies/Examination Semester V

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Database Management Systems	3	0	0	3	30	70	100
2	PCC		Theory of Computation	3	0	0	3	30	70	100
3	PCC		Programming in JAVA	3	0	0	3	30	70	100
4	PCC		Block Chain Technology	3	0	0	3	30	70	100
5	OEC		Open Elective I	3	0	0	3	30	70	100
6	PEC		Professional Elective I	3	0	0	3	30	70	100
7	BSC		Communication and Interpersonal Skills	3	0	0	3	30	70	100
8	LC		Database Management Systems Lab (P)	0	0	2	1	50	50	100
9	LC		Programming in JAVA Lab (P)	0	0	2	1	50	50	100
10	LC		Block Chain Technology Lab (P)	0	0	2	1	50	50	100
			Practical Training-I	0	0	2	1	50	50	100
Total				21	0	8	25			1100

NOTE:

1. Choose any one from Professional Elective Course – I
2. Choose any one from Open Elective Course – I*

Professional Elective Course – I

1. Introduction to Physical and Systems Security
2. Software Security and Trusted Systems
3. Biometrics and its Applications
4. Cyber Security Threats

* **Open Elective Course – I:** To be chosen from the bucket of Open Elective Course-I

DATABASE MANAGEMENT SYSTEMS

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Database Management Systems				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
3. To understand and use data manipulation language to query, update, and manage a database
4. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1. For a given query, write relational algebra expressions for that query and optimize the developed expressions
- CO2. For a given requirement specification, design the databases using E R method and normalization.
- CO3. For a given specification, construct the SQL queries for Open source and Commercial DBMS - MYSQL, ORACLE, and DB2.
- CO4. For a given query, optimize its execution using Query optimization algorithms
- CO5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
- CO6. Implement the isolation property, including locking, and time stamping based on concurrency control and Serializability of scheduling.

UNIT - I

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations.

UNIT - II

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency

preservation, Lossless design.

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

UNIT - III

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Storage strategies: Indices, B-trees, hashing,

UNIT - IV

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Advanced topics: Object-oriented and object-relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

TEXT AND REFERENCE BOOKS:

1. Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
2. Principles of Database and Knowledge–Base Systems, Vol 1 by J. D. Ullman, Computer Science Press.
3. Fundamentals of Database Systems, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
4. Foundations of Databases, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

THEORY OF COMPUTATION

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Theory of Computation				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand basic concepts of formal languages and automata theory.
2. To study the types of Automata i.e., NFA, DFA, NFA with ϵ -transition and their interconversion methods and importance.
3. To Study formal languages of different kinds, such as regular and context-free languages. Understand the concept of grammar and its types. Removal of ambiguity and reduced form and Normal forms of grammar.
4. To develop the concepts and design of higher-level automata to accept the language not accepted by finite automata such as PDA & Turing machine.
5. To study the various properties of Turing machines and their design.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Define terminology related to the theory of computation.

CO2: Explain the basic concepts and applications of Theory of Computation.

CO3: Apply the principles of Theory of Computation to solve computational problems.

CO4: Compare and contrast the hierarchy of grammars.

CO5: Design various types of automata for given problems.

CO6: To solve various problems of applying normal form techniques, push-down automata, and Turing Machines.

UNIT - I

Finite Automata: Introduction: Set, Power Set, Super Set, Alphabet, languages and grammars, productions and derivation, Deterministic finite automata (DFA), Non-Deterministic finite automata (NFA), Equivalence of DFA and NFA, Conversion of NFA to DFA, minimization of finite automata, Finite automata with ϵ - moves, Acceptability of a string by a finite Automata.

Introduction to Machines: Properties and limitations of Finite Automata, Mealy and Moore Machines, Equivalence of Mealy and Moore machines.

UNIT - II

Regular Expression: State and prove Arden's Method, Regular Expressions, Recursive definition of the regular expression, Regular expression conversion to Finite Automata, and vice versa.

Properties of regular languages: Regular language, pumping lemma for regular sets/languages, Application of regular languages.

UNIT - III

Grammars: Chomsky hierarchy of languages, Relation between different types of grammars, Context-free grammar, Derivation tree / Parse tree, Ambiguity in regular grammar and their removal,

Reduced Forms: Removal of useless symbols, null and unit productions, Normal Form: Chomsky Normal form (CNF) and Greibach Normal Form (GNF),

Push Down Automata: Introduction to PDA, Deterministic and Non-Deterministic PDA, Design of PDA: Transition table, Transition diagram and acceptability of strings by designed PDA, Pushdown automata (PDA) and equivalence with CFG.

UNIT - IV

Turing machines: The basic model for Turing machines I, Deterministic and Non- Deterministic Turing machines and their equivalence, Design of Turing Machines: Transition table, Transition diagram and acceptability of strings by a designed Turing machine. Variants of Turing machines, Halting problem of Turing machine, PCP Problem of Turing Machine, Linear Bounded Automata, TMs as enumerators.

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

TEXT AND REFERENCE BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
3. K. L. P Mishra, N. Chandrashekar (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
4. Raymond Greenlaw, H. James Hoover, Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
5. John C. Martin: Introduction to Languages and Automata Theory, 3rd edition, Tata McGraw- Hill, 2007

PROGRAMMING IN JAVA

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Programming in JAVA				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Explore advanced topic of Java programming for solving problems
2. Be able to put into use the advanced features of the Java language to build and compile robust enterprise- grade applications
3. Provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business
4. Design and develop GUI applications using Swings
5. Enhance knowledge to manipulate and store data
6. To provide foundations on Java Beans, Struts and JSON
7. To analyze the object-oriented paradigm using java programming language

COURSE OUTCOMES:

- CO1: Identify classes, objects, members of a class and relationships among them for a specific problem.
- CO2: Understand and demonstrate the concepts of garbage collection, polymorphism, inheritance etc.
- CO3: Do numeric (algebraic) and string-based computation.
- CO4: Understand and implement modularity as well as basic error-handling techniques.
- CO5: Develop, design and implement small multithreaded programs using Java language.
- CO6: Apply appropriate problem-solving strategies for the implementation of small/medium scale Java applications

UNIT-I

INTRODUCTION TO JAVA: Evolution of Java, Object Oriented Programming Structure, Overview and characteristics of Java, Java program Compilation and Execution Process, Organization of the Java Virtual Machine, Client side Programming, Platform Independency & Portability, Security, Relation b/w JVM, JRE and JDK, Introduction to JAR format, Naming Conventions, Data types & Type casting, operators, Security Promises of the JVM, Security Architecture and Security Policy, security aspects, sandbox model.

UNIT-II

OOPS IMPLEMENTATION: Classes, Objects, attributes, methods, data encapsulation, reference variables, Constructors, Anonymous block, Method Overloading, Static Data members, Block & methods; Memory Structure: Stack, Heap, Class & Method area
Class loading & Execution flow: Static vs Dynamic Class loading, implicit vs explicit class loading, class loading operations;

Argument Passing Mechanism: Passing primitive arguments, passing objects, Wrapper Classes; This keyword: Referencing instance members, Intra class constructor chaining, Method chaining; Inheritance & code reusability: Extending classes for code reusability, Usage of super keyword, Method Overriding, Object class

INHERITANCE & RUNTIME POLYMORPHISM: Static & Dynamic binding, Inheritance and Is-A relation, Runtime Polymorphism and Generalization, Abstract classes & methods, Final Keyword; Interfaces and Role based Inheritance: Feature & Role based Inheritance, Static & Dynamic classing Environment, classes & interfaces, interface applications in real scenarios; Has-A relation: Aggregation & Composition, Nested classes, Inner classes, Anonymous Inner classes, String Buffer Class, tokenizer, applets, Life cycle of applet and Security concern

UNIT-III

THREADS: Creating Threads, Thread Priority, Blocked States, Extending Thread Class, Runnable Interface, Starting Threads, Thread Synchronization, Synchronize Threads, Sync Code Block, Overriding Synced Methods, Thread Communication, wait, notify and notify all.

SWING & AWT:

Swing class hierarchy, containers, user interface components, graphics context, AWT Components, Component Class, Container Class, Layout Manager Interface Default Layouts, Insets and Dimensions, Border Layout, Flow Layout, Grid Layout, Card Layout Grid Bag Layout AWT Events, Event Models, Listeners, Class Listener, Adapters, Action Event Methods Focus Event Key Event, Mouse Events, Window Event

PACKAGE & SCOPES: Need of Packages, associating classes to Packages, Class path environment variable, Import Keyword and Feature of static import, Public, protected, private & default scope, Private Inheritance;

EXCEPTION HANDLING: exception and error, Exception Handling & Robustness, Common Exceptions and Errors, Try and catch block, Exception handlers, throw keyword, Checked and Unchecked Exceptions, Role of finally, User defined Exceptions.

UNIT-IV

COLLECTION FRAMEWORK: Role and Importance of Collection Framework, List & Set based collection, Iterator & List Iterator, Maps, Searching elements in List, Hash and Tree based collections, Role of equals and hashCode() methods, Comparable and Comparator Interfaces, Thread Safety and Vector, Difference b/w Enumeration and Iterator, Type safety and Generics, Common algorithms and Collections class, Using Properties class for managing properties files;

Database Connectivity Using JDBC: Overview of native and ODBC Drives, Introduction to JDBC, Type of JDBC drivers, Usage of drivers, defining properties-based Connection Factory; Basic database operations: Insert, Delete, Update, and Select;

Prepared Statement: Statement, Prepared Statement, Setting Query parameters, Executing Queries;

TEXT AND REFERENCE BOOKS:

1. E. Balaguruswamy, "Programming with Java", TMH
2. Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley.
3. Decker & Hirshfield, "Programming Java", Vikas Publication.
4. Patrick Naughton and HerbertzSchidt, "Java-2 the complete Reference", TMH
5. Sierra & bates, "Head First Java", O'Reilly.

BLOCK CHAIN TECHNOLOGY

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Block Chain Technology				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To enable the student to understand and appreciate, the importance of fundamentals of blockchain technology and application of cryptography in blockchain
2. To gain the awareness about the concepts of various implementations of blockchain technology such as bitcoin, Ethereum, and Hyper ledger

COURSE OUTCOMES:

- CO1. Student will be able to understand the fundamentals of blockchain technology.
- CO2. Apply knowledge of implementations of Bitcoin to develop solutions in the appropriate domains.
- CO3. Apply knowledge of implementations of Ethereum to develop solutions in the appropriate domains.
- CO4. Apply knowledge of implementations of Hyperledger to develop solutions in the appropriate domains.
- CO5. Explore the blockchain technology to apply in real world problems of cryptography domains

UNIT-I

INTRODUCTION TO BLOCKCHAIN TECHNOLOGY: Distributed systems – The history of blockchain – Introduction to blockchain – CAP theorem and blockchain – Benefits and limitations of blockchain – Decentralization using blockchain - Methods of decentralization – Routes to decentralization

UNIT-II

CRYPTOGRAPHY IN BLOCKCHAIN: Introduction – cryptographic primitives – Assymmetric cryptography – public and private keys -line interface – Bitcoin improvement proposals (BIPs) – Consensus Algorithms.

UNIT-III

BITCOIN: Introduction – Transactions – Structure - Transactions types – The structure of a block– The genesis block – The bitcoin network– Wallets and its types– Bitcoin payments– Bitcoin investment and buying and selling bitcoins – Bitcoin installation – Bitcoin programming and the command-line interface – Bitcoin improvement proposals (BIPs).

UNIT-IV

ETHEREUM: Ethereum block chain- Elements of the Ethereum block chain– Precompiled contracts – Accounts and its types – Block header- Ether – Messages – Mining - Clients and wallets – Trading and investment – The yellow paper - The Ethereum network - Applications developed on Ethereum - Scalability and security issues

TEXT AND REFERENCE BOOKS:

1. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd Revised edition edition. Birmingham: Packt Publishing, 2018.
2. M. Antonopoulos, Mastering bitcoin, First edition. Sebastopol CA: O'Reilly, 2015.
3. Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, —An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends, in 2017 IEEE International Congress on Big Data (BigData Congress), 2017, pp.557–564.

COMMUNICATION AND INTERPERSONAL SKILLS

Semester	V				
Course code					
Category	Basic Science Course				
Course title	Communication and Inter Personal Skills				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVES:

To enhance holistic development of students and improve their employability skills. Provide a 360degree exposure to learning elements of Business English readiness program, behavioral traits, achieve softer communication levels. To up skill and upgrade students' across varied industry needs to enhance employability skills. By the end of this semester, the student will have entered the employability enhancement and skill building activity exercise.

COURSE OUTCOMES:

- CO1. At the end of the session a student would have learned what is VMOSA (Vision, Mission, Values and Ethics) and Communication Process. This would help students understand and interpret the deeper meaning of life.
- CO2. At the end of the session a student would have learned Communication Styles and flexing and 4 social styles of communication which will lead to effective and meaningful communication process along with Listening Styles & Listening Skills.
- CO3. At the end of the session a student would have learned the Art of giving feedback, assess and evaluate real life situations better.
- CO4. At the end of the session a student would have learned business writing skills and non-verbal communication process to make an impression in written communication process in office or otherwise coupled with positive body language and non-verbal communication.
- CO5. A student will learn to probe skills that will help in improving peer to peer and business communication

UNIT- I

IMPRESS TO IMPACT: What is Personality?, Creating a positive impression – The 3 V's of Impression, Individual Differences and Personalities, Personality Development and Transformation ,Building Self Confidence.

UNIT-II

BEHAVIORAL AND INTERPERSONAL SKILLS: Avoiding Arguments, The Art of Assertiveness, Constructive Criticism, The Personal Effectiveness Grid, Assessing our Strengths & Limitations and Creating an Action Plan for Learning with the 4M Model, Verbal Abilities

UNIT-III

POSITIVE THINKING & ATTITUDE BUILDING: Goal Setting and SMART Goals – Milestone Mapping | Enhancing L S R W G and P (Listening Speaking Reading Writing Grammar and Pronunciation), VMOSA (Vision, Mission, Values and Ethics), Business Communication - Verbal Communication Skills, Barriers in communication, Basics of effective communication – PRIDE Model

UNIT-IV

COMMUNICATIONS: Different styles of communication & style flexing (Based on the 4 social styles- Analytical, Driving, Expressive, Amiable), Importance of Listening & practice of Active Listening, Email Etiquette, Business Writing Skill, Telephone Etiquette Skills (Telephone Handling Skills), Non-Verbal Communication-Kinesics, Proxemics, Paralanguage, MTI Reduction Program.

TEXT AND REFERENCE BOOKS:

1. Power of Positive Action (English, Paperback, Napoleon Hill)
2. Streets of Attitude (English, Paperback, Cary Fagan, Elizabeth Wilson)
3. The 6 Pillars of self-esteem and awareness – Nathaniel Brandon
4. Goal Setting (English, Paperback, Wilson Dobson)

PROGRAMMING IN JAVA LAB

Semester	V				
Course code					
Category	Lab Courses				
Course title	Programming in JAVA Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to:

- CO1. Implement Java programs using object-oriented concepts for problem solving.
- CO2. Detect syntax and logical errors in java programs.
- CO3. Apply exception handling for making robust JAVA code.
- CO4. Design java applications using File I/O and GUI.
- CO5. Create lab record of the solutions of assignments that includes problem definitions, solutions and conclusions.
- CO6. Demonstrate ethical practices, self-learning and team spirit.

EXPERIMENTS

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the 5 exception keywords.
5. Convert the content of a given file into the upper-case content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

DATABASE MANAGEMENT SYSTEM LAB

Semester	V				
Course code					
Category	Lab Courses				
Course title	Database Management System Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1. Understand basic concepts of database system and data models for relevant problems.
- CO2. Understand the basic elements of a relational database management system.
- CO3. Design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
- CO4. Apply normalization for the development of application software.

EXPERIMENTS

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, synonyms, Sequences, indexes, and save points.
4. Creating an employee database to set various constraints.
5. Creating relationships between the databases. iv. Study of PL/SQL block.
6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Creation of Procedures
9. Creation of database triggers and functions
10. Mini project (Application Development using Oracle/ MySQL)
11. Inventory Control System
12. Material Requirement Processing.
13. Hospital Management System.
14. Railway Reservation System.
15. Personal Information System.
16. Web-Based User Identification System.
17. Time Table Management System.
18. Hotel Management

BLOCK CHAIN TECHNOLOGIES LAB

Semester	V				
Course code					
Category	Lab Courses				
Course title	Block Chain Technologies Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES

This course will enable the students:

1. Understanding Block chain Fundamentals and creating basic blocks.
2. Able to Develop Block chain Applications in a structured manner
3. Ability to create own crypto currency and get familiarity with future currencies.
4. Able to Evaluate and Analyze Block chain Systems

COURSE OUTCOMES

- CO1. Knowledge of Blockchain Concepts and creating basic blocks.
- CO2. Proficiency in Blockchain Development.
- CO3. Ability to Design and Implement Blockchain Applications.
- CO4. Evaluation and Analysis of Blockchain Systems.
- CO5. Knowledge of crypto currency and creating a basic form of it.

EXPERIMENTS

1. Creating Merkle tree
2. Creation of Block
3. Block chain Implementation Programming code
4. Creating ERC20 token
5. Java code to implement blockchain in Merkle Trees
6. Java Code to implement Mining using block chain
7. Java Code to implement peer-to-peer using block chain
8. Creating a Crypto-currency Wallet

PRACTICAL TRAINING - I

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Practical Training - I				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

The evaluation of Practical Training - I will be based on the seminar, viva voice, and report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded an 'F' grade is required to repeat Practical Training.

A	Excellent
B	Good
C	Satisfactory
F	Not Satisfactory

**Professional
Elective
Course - I**

INTRODUCTION TO PHYSICAL AND SYSTEMS SECURITY

Semester	V			
Course code				
Category	Professional Elective Course			
Course title	Introduction to Physical and Systems Security			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

To provide students with:

1. Physical, technical and procedural controls, including good environment design and premises security
2. Understanding issues involved in security
3. Reducing risks when moving data
4. Securely disposing of data
5. Maintaining security in delivery area

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: understand and implement physical and software security

CO2: Apply software security issues

CO3: Maintain security measures and apply in real world problems

CO4: Reduce security risks in different areas

CO5: Perform virtualization security in different fields

UNIT-I

OVERVIEW OF PHYSICAL SECURITY: Physical Security Threats, Physical Security Prevention and Mitigation Measures, Recovery from Physical Security breaches, Integration of Physical and Logical Security

UNIT-II

INTRODUCTION TO SOFTWARE SECURITY: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with Operating Systems and Other Programs, Handling Program Output

UNIT -III

INTRODUCTION TO OPERATING SYSTEM SECURITY: System Security Planning, Operating System Hardening, Application security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security

UNIT-IV

INTRODUCTION TO HUMAN RESOURCES SECURITY: security Awareness, Training and Education, employment Practices and Policies, Email and Internet use Policies, Computer Security Incident Response Teams

TEXT AND REFERENCE BOOKS:

1. Industrial Network Security: Securing Critical Infrastructure Networks for Smart Grid,

SCADA, and Other Industrial Control Systems 2nd Edition

2. Applied Cyber Security and the Smart Grid: Implementing Security Controls into the Modern Power Infrastructure 1st Edition

SOFTWARE SECURITY AND TRUSTED SYSTEMS

Semester	V			
Course code				
Category	Professional Elective Course			
Course title	Software Security and Trusted Systems			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Understand the issues of software security and apply in real world problems
2. Learn different models for computer security
3. Study of different internet authentication

COURSE OUTCOMES:

- CO1. Understand the issues of software security
- CO2. Emphasize different types of software security
- CO3. Choose different models and applications for system security
- CO4. Understand different wireless security in areas
- CO5. Learn applications of internet authentication

UNIT-I

INTRODUCTION TO SOFTWARE SECURITY AND ITS ISSUES: Writing safe program code, interacting with Operating System and Other programs, Handling Program Output, Introduction to Operating System Security, Computing and Multilevel Security

UNIT-II

OPERATING SYSTEM SECURITY: System Security Planning, Operating System Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security

UNIT-III

BELL-LAPULA MODEL FOR COMPUTER SECURITY: Formal Models for Computer Security, Concept of Trusted Systems, Application of Multilevel Security, Trusted computing and Trusted Platform Module, Common criteria for Security Evaluation, assurance and Evaluation

UNIT-IV

WIRELESS AND MOBILE SECURITY: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview and its Security, SSL and transport Layer Security, Internet Authentication Applications: Kerberos. X.509.

TEXT AND REFERENCE BOOKS:

1. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws by Dafydd Stuttard and Marcus Pinto
2. Applied Cryptography: Protocols, Algorithms, and Source Code in C by Bruce Schneier

BIOMETRICS AND ITS APPLICATIONS

Semester	V				
Course code					
Category	Professional Elective Course				
Course title	Biometrics and its Applications				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand the basics of biometrics and its functionalities
2. To learn the role of biometric in the organization
3. To learn to develop applications with biometric security

COURSE OUTCOMES:

- CO1. Summarize biometrics overview and applications
- CO2. Choose suitable security techniques for biometric
- CO3. Identify the multidisciplinary technologies for biometric applications
- CO4. Designing models for Physiological and Behavioral Systems
- CO5. Applying components and algorithms for pattern recognition
- CO6. Apply different applications of Biometrics

UNIT-I

INTRODUCTION TO BIOMETRICS:

What is Biometrics, Biometric Systems, Evolution of Biometrics, Basic Components of Biometric System, General Working of Biometric Systems, Biometric Terminologies, Application Areas of Biometrics, Types of Biometric Modalities

UNIT-II

PHYSIOLOGICAL AND BEHAVIORAL MODALITIES:

Fingerprint Recognition System, Facial Recognition System, Iris Recognition System, Retinal Scanning System, Hand Geometry Recognition System, DNA Recognition System, Gait Recognition. Signature Recognition System, Keystroke Recognition System, Voice Recognition System, Difference between voice and speech recognition

UNIT-III

MULTIMODAL BIOMETRIC SYSTEMS:

Need of Multimodal Biometric, working of multimodal biometric systems, design issues with multimodal biometric, criteria for effective biometric system, comparison of biometric modalities, performance measurements

UNIT-IV

BIOMETRICS AND APPLICATIONS:

Pattern Recognition in Biometrics, Components in Pattern Recognition, Algorithms in Pattern Recognition, Signal Processing in Biometrics, Digital Signal Processing Systems, DSP in Biometrics, Image Processing in Biometrics, Biometric System Security and Risks involved.

TEXT AND REFERENCE BOOKS:

1. Handbook of Biometrics, by Anil K. Jain, Patrick Flynn, Arun A. Ross.
2. J.L. Wayman, A. Jain, D. Maltoni, and D. Maio, Biometric Systems Technology, Design and Performance Evaluation, Springer , ISBN: 9781852335960

3. Guide to Biometrics, R. M. Bolle, S. Pankanti, N.K. Ratha, A. W. Senior, J. H. Connell, Springer 2009 ISBN 978-0387400891,
4. A.A. Ross, K. Nandakumar, and A.K. Jain, Handbook of Multibiometrics, Springer , ISBN: 9780387222967.

CYBER SECURITY THREATS

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Cyber Security Threats				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
2. The learner will understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
3. The learner will be able to examine secure software development practices.
4. The learner will understand principles of web security.
5. The learner will be able to incorporate approaches for risk management and best practices.
6. The learner will gain an understanding of cryptography, how it has evolved, and some key encryption techniques used today.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1: Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
- CO2: Design, develop, test and evaluate secure software.
- CO3: Develop policies and procedures to manage enterprise security risks.
- CO4: Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.
- CO5: Interpret and forensically investigate security incidents.

UNIT - I

INTRODUCTION: Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crimes. Network Threats: Active/ Passive – Interference – Interception – Impersonation – Worms –Virus – Spam’s – Ad ware - Spy ware – Trojans and covert channels – Backdoors – Bots – IP, Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats - Threats to Server security.

UNIT - II

SECURITY THREAT MANAGEMENT: Risk Assessment - Forensic Analysis - Security threat correlation –Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools –Threat identification - Threat Analysis - Threat Modelling - Model for Information Security Planning.

UNIT - III

SECURITY ELEMENTS: Authorization and Authentication - types, policies and techniques – Security certification - Security monitoring and Auditing - Security Requirements Specifications – Security Policies and Procedures, Firewalls, IDS, Log Files, Honey Pots

UNIT - IV

ACCESS CONTROL: Trusted Computing and multilevel security - Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors – Security awareness, training, Email and Internet use policies.

TEXT AND REFERENCE BOOKS:

1. Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press, 2004.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall, 2008.
3. Joseph M Kizza, “Computer Network Security”, Springer Verlag, 2005
4. Thomas Calabres and Tom Calabrese, “Information Security Intelligence: Cryptographic Principles & Application”, Thomson Delmar Learning, 2004.

6th

SEMESTER

B.Tech. Computer Science and Engineering (Cyber Security)

Scheme of Studies/Examination Semester VI

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Computer Networks	3	0	0	3	30	70	100
2	PCC		Cyber for Data Science and its applications	3	0	0	3	30	70	100
3	PCC		Intrusion Detection Systems	3	0	0	3	30	70	100
4	PEC		Professional Elective –II	3	0	0	3	30	70	100
5	OEC		Open-Elective-II	3	0	0	3	30	70	100
	PEC		Professional Elective -III	3	0	0	3	30	70	100
7	LC		Computer Networks Lab (P)	0	0	2	1	50	50	100
8	LC		Cyber for Data Science and its applications Lab (P)	0	0	2	1	50	50	100
9	PROJ		Project-I	0	0	4	2	50	50	100
Total				18	0	8	22			900

NOTE:

- At the end of the 6th semester, each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training center etc. and submit the typed report along with a certificate from the organization & its evaluation shall be carried out in the 7th Semester.
- Choose any one from Professional Elective Course – II & III
- Choose any one from Open Elective Course – II*

Professional Elective Course – II

- Cyber Crimes and Laws
- Database and Cloud Security
- Malware Analysis and Reverse Engineering
- Steganography & Digital Watermarking

Professional Elective Course – III

- Software Testing and Project Management
- Data Mining and Warehousing
- Social network Analysis
- Cryptocurrency with Ethereum

***Open Elective Course – II :** To be chosen from the bucket of Open Elective Course-II

NOTE: At the end of 6th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/Institute/ Professional Organization/Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 7th Semester.

COMPUTER NETWORKS

Semester	VI			
Course code				
Category	PCC			
Course title	COMPUTER NETWORKS			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit

COURSE OBJECTIVES:

1. To develop an understanding of modern network architectures from a design and Performance perspective.
2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs), and Wireless LANs (WLANs).
3. To provide an opportunity to do Network programming.
4. To provide WLAN measurement ideas.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1: Explain the functions of the different layers of the OSI Protocol.
- CO2: Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs), and Wireless LANs (WLANs) and describe the function of each.
- CO3: Identify and connect various connecting components of a computer network.
- CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, and Firewalls using open-source available software and tools.
- CO5: outline various models, topologies and devices of Computer Networks.

UNIT - I

INTRODUCTION:

Data communication, Components, Data Representation, Simplex, Half Duplex, and Full Duplex Transmission, Modulation, Multiplexing, Computer networks, distributed processing, Internet, Topologies, Packet and circuit switching, connectionless and connection- oriented services.

Network Models: OSI model and TCP/IP Model Physical Layer – LAN: Ethernet.

UNIT - II

DATA LINK LAYER AND MEDIUM ACCESS SUB LAYER: MAC Addressing, Framing, Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window Protocol.

MEDIUM ACCESS CONTROL: Random access, Controlled Access, and channelization protocols.

NETWORK LAYER: Logical addressing, classful and classless addressing, subnetting, Ipv4, ICMPv4, ARP, RARP and BOOTP, Ipv6, Ipv6 addressing.

UNIT - III

NETWORK DEVICES: Repeater, hub, switch, router, and gateway.

ROUTING ALGORITHMS: Introduction to routing, Shortest Path Algorithm, Flooding, Hierarchical Routing, Link State, and Distance Vector Routing

TRANSPORT LAYER: Process to Process Communication, User Datagram Protocol

(UDP), Transmission Control Protocol (TCP), TCP connection management.

UNIT - IV

APPLICATION LAYER: Congestion Control, Quality of Service, QoS Improving techniques, Domain Name Space (DNS), EMAIL, File Transfer Protocol (FTP), HTTP, SNMP

NETWORK SECURITY: Firewalls, security goals, types of attack, symmetric and asymmetric key ciphers.

TEXT AND REFERENCE BOOKS:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, latest Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, latest Edition Douglas Comer, Prentice Hall of India.
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

CYBER FOR DATA SCIENCE AND ITS APPLICATIONS

Semester	VI			
Course code				
Category	PCC			
Course title	Cyber for Data Science and its Applications			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

This courses makes the students understand the basics of data science and its applications for cyber security.

COURSE OUTCOMES:

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

CO 1 Understand and implement the basics of programming in Python.

CO 2 Understand and implement the Collections in Python.

CO 3 Apply Object Oriented Programming concepts on real world examples.

CO 4 Apply the Numpy package for numerical calculations in Python.

CO 5 Apply Pandas package for loading and preprocessing data in Python.

UNIT -I

BASICS OF PYTHON AND THEIR DATA TYPES:

Variables and Identifiers , Operators, Expressions and Data Types, What Is a Control Structure, Boolean Expressions (Conditions), Relational Operators, Membership Operators, Selection Control, Multi-Way Selection, Iterative Control, While Statement , Infinite loops, Definite vs. Indefinite Loops, Boolean Flags and Indefinite Loops, List Structures, Common List Operations, Tuples , Nested Lists, For Loops , While Loops and Lists (Sequences), Assigning and Copying Lists , Dictionary Type in Python, Set Data Type , Program Routines , Defining Functions, More on Functions , Calling Value-Returning Functions, Calling Non-Value- Returning Functions, Parameter Passing, Arguments in Python Default Arguments in Python, Variable Scope, Recursive Function

UNIT-II

NUMPY:

Creation on Array, Array generation from Uniform distribution, Random array generation, reshaping, maximum and minimum, reshaping, Arithmetic operations, Mathematical functions, Bracket Indexing and Selection, Broadcasting, Indexing a 2D array (matrices);

UNIT-III

PANDAS:

Creating a Series - from lists, arrays and dictionaries, Storing data in series from intrinsic sources, Creating DataFrames, Imputation, Grouping and aggregation, Merging, Joining, Concatenation, Find Null Values or Checkfor Null Values, Reading data from csv, txt, excel

UNIT-IV

VISUALIZATION USING MATPLOTLIB: Installing and setting up visualization libraries, Canvas and Axes, Subplots, Common plots – scatter, histogram, boxplot, Logarithmic scale, Placement of ticks and custom tick labels, Pandas Viz, Style Sheets, Plot type, Area, Barplots, Histograms, Line Plots, Scatter Plots, BoxPlots, Hexagonal Bin Plot, Kernel Density Estimation plot (KDE), Distribution Plots, Categorical Data Plots,

Combining Categorical Plots, Matrix Plots, Regression Plots, Grids.

TEXT AND REFERENCE BOOKS:

1. Charles Dierbach., Introduction to Python using Computer Science, Wiley Publications, Second Edition,2015
2. Mark Lutz , Learning Python, O'Reilly publications , Fifth Edition, 2015
3. Introduction to linear algebra - by Gilbert Strang
4. Applied statistics and probability for engineers – by Douglas Montgomery
5. Mastering python for data science, Samir Madhavan

INTRUSION DETECTION SYSTEM

Semester	VI			
Course code				
Category	PCC			
Course title	Intrusion Detection Systems			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Compare alternative tools and approaches for Intrusion Detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion.
2. Identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities all intrusion detection systems share.

COURSE OUTCOMES:

- CO1. Possess a fundamental knowledge of Cyber Security.
- CO2. Understand the vulnerability in network and address common vulnerabilities.
- CO3. Know basic and fundamental risk management principles as it relates to IDPS
- CO4. Analyse the network behaviour and prevention techniques
- CO5. Understand and analyse host based IDPS
- CO6. Understand and analyse Multiple IDPS Technologies
- CO7. Analyse various IDPS Products

UNIT-I

IDPS TECHNOLOGIES AND NETWORK-BASED IDPS:

Components & Architecture – Network architecture, Security capabilities- information gathering, logging, detection, prevention capabilities, Management- Implementation, operation & maintenance, building & maintaining skills Networking Overview- Application Layer, Transport Layer, Network Layer, Hardware Layer, Components and Architecture, Typical Components, Network Architectures and Sensor Locations, Security Capabilities, Information Gathering Capabilities, Logging Capabilities, Detection Capabilities, Prevention Capabilities, Management- Implementation, Operation and Maintenance

UNIT-II

NETWORK BEHAVIOR ANALYSIS:

Components and Architecture, Typical Components, Network Architecture Sensor Locations, Security Capabilities-Information Gathering Capabilities, Logging Capabilities, Detection Capabilities, Prevention Capabilities, Management, Implementation, Operation and Maintenance

UNIT-III

HOST BASED IDPS:

Components and Architecture, Typical Components, Network Architectures, Agent Locations, Host Architectures, Security Capabilities, Logging Capabilities, Detection Capabilities, Prevention Capabilities, Other Capabilities.

UNIT-IV

IDPS TECHNOLOGIES:

The Need for Multiple IDPS Technologies, Integrating Different IDPS Technologies, Direct IDPS Integration, Indirect IDPS, Integration Other Technologies with IDPS Capabilities, Network Forensic Analysis Tool (NFAT) Software, Anti- Malware Technologies, Firewalls and Routers, Honeypots, General Requirements, Security Capability Requirements, Performance Requirements, Life Cycle Costs, Evaluating Products, IDPS Testing Challenges, Recommendations for IDPS Evaluations

TEXT AND REFERENCE BOOKS:

1. Guide to Intrusion Detection and Prevention Systems- Karen Scarfone Peter Mell- Computer Security Division Information Technology Laboratory National Institute of Standards and Technology Gaithersburg, National Institute of Standards and Technology Special Publication 800-94
2. Tim Crothers, Implementing Intrusion Detection Systems: A Hands-On Guide for Securing the Network, John Wiley and Sons.
3. Christopher Kruegel, FedrickValeur, Intrusion Detection and Correlation: Challenges and Solutions, Springer.

COMPUTER NETWORKS LAB

Semester	VI				
Course code					
Category	Lab Courses				
Course title	COMPUTER NETWORKS LAB				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

COURSE OUTCOMES:

After completing the course, students will be able to:

- CO1. Understand the structure and organization of computer networks; including the division into network layers, role of each layer, and relationships between the layers.
- CO2. Understand the basic concepts of application layer protocol design; including client/server models, peer to peer models, and network naming.
- CO3. In depth understanding of transport layer concepts for congestion control and flow control.
- CO4. Learning protocol design; including connection oriented and connection-less models, techniques to provide reliable data delivery and algorithms
- CO5. Applying and configuring virtual LANS

EXPERIMENTS

1. To construct a simple network topology on Packet Tracer.
2. To verify and configure VLAN and VLAN trunk in packet tracer.
3. To construct RJ45 cable.
4. a) To configure simple static routing.
b) To implement Security on interconnecting devices.
5. To configure a Network Topology constitutes Routers and Switches using Packet Tracer.
- 6 Working with complex network topologies.
7. Mid Term Evaluation
8. To monitor network traffic using Wire Shark
9. To get the MAC or Physical Address of the system Using Address Resolution Protocol.
10. To Configure network using Routing Information Protocol (RIP)
- 11 To configure network state routing protocol (OSPF).
- 12 To configure Border Gateway Protocol.
- 13 To configure Application Layer protocols: DHCP and DNS.

CYBER FOR DATA SCIENCE AND ITS APPLICATIONS LAB

Semester	VI				
Course code					
Category	Lab Courses				
Course title	Cyber for Data Science and its Applications LAB				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

1. Understand the process of Importing and Exporting the data.
2. Learn how to collect, store and manage data from multiple data sources.
3. Know the insights of data using statistical methods
4. Identify different techniques for data analysis and data visualization.
5. Discuss the applications of Data Science for real world problems.

COURSE OUTCOMES:

After completion of the course, students would be able to:

- CO1. Examine the process for importing and exporting the data.
- CO2. Apply appropriate data collection and pre-processing methods.
- CO3. Identify different data analysis Techniques suitable for a given application
- CO4. Demonstrate data visualization techniques for Data Analysis.
- CO5. Applying the concepts of data science in cyber applications

EXPERIMENTS

1. Take Kaggle dataset CyberCrimeIndia and perform following operations:
2. Total number of features
3. Total number of missing values
4. Total number of unique values
5. Finding correlation matrix
6. Finding rate of total cyber crimes (2018)
7. Finding total number of categorical features
8. Performing Label Encoding on dataset
9. Splitting data into training and testing datasets and performing hot-encoding categorical features
10. Finding plot for one hot-encoder
11. Finding graph for mean estimated rate of cyber crimes 2018
12. Plot minimum estimated cyber crimes 2017.
13. Plot minimum percentage share of state/UT
14. Plot rate of total cyber crimes in 2017 and 2018
15. Plot mid-year projected population in 2016, 2017 and 2018
16. Plot rate of cyber crimes and mid-year projected population in 2018.

**Professional
Elective
Course - II**

CYBER CRIMES AND LAWS

Semester	VI			
Course code				
Category	PEC			
Course title	Cyber Crimes and Laws			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

This paper intends to create an understanding towards the cyber crimes and to familiarise the students with the application of cyber laws in general.

COURSE OUTCOMES:

- CO1. Make Learner Conversant With The Social And Intellectual Property Issues Emerging From ‘Cyberspace.
- CO2. Explore The Legal And Policy Developments In Various Countries To Regulate Cyberspace;
- CO3. Develop The Understanding Of Relationship Between Commerce And Cyberspace; And
- CO4. Give Learners In Depth Knowledge Of Information Technology Act And Legal Frame Work of Right To Privacy, Data Security And Data Protection.
- CO5. Make Study On Various Case Studies On Real Time Crimes.

UNIT-I

CYBER CRIMES:

Introduction — Computer Crime and Cyber Crimes: Distinction between Cyber Crime and Conventional Crimes; Cyber Forensic; Kinds of Cyber Crimes — Cyber Stalking, Cyber Terrorism, Forgery and Fraud, Crimes Related to IPRs, Computer Vandalism: Privacy of Online Data; Cyber Jurisdiction; Copyright Issues; Domain Name Dispute, etc.

UNIT-II

DEFINITION AND TERMINOLOGY (INFORMATION TECHNOLOGY ACT, 2000):

Concept of Internet, Internet Governance, E-contract, E-forms, Encryption, Data Security. Access, Addressee, Adjudicating Officer, Affixing Digital Signatures, Appropriate Government, Certifying Authority, Certification Practice Statement, Computer, Computer Network, Computer Resource, Computer System, Cyber Appellate Tribunal, Data, Digital Signature, Electronic Form, Electronic Record, Information, Intermediary, Key Pair, Originator, Public Key, Secure System, Verify, Subscriber as defined in the Information Technology Act, 2000.

UNIT-III

ELECTRONIC RECORDS:

Authentication of Electronic Records; Legal Recognition of Electronic Records; Legal Recognition of Digital Signatures; Use of Electronic Records and Digital Signatures in Government and its Agencies; Retention of Electronic Records; Attribution, Acknowledgement and Dispatch of Electronic Records; Secure Electronic Records and Digital Signatures.

UNIT-IV

REGULATORY FRAMEWORK:

Regulation of Certifying Authorities; Appointment and Functions of Controller; License to Issue Digital Signatures Certificate; Renewal of License; Controller’s Powers; Procedure to be Followed by Certifying Authority; Issue, Suspension and Revocation of Digital Signatures Certificate, Duties of Subscribers; Penalties and Adjudication; Appellate Tribunal; Offences.

TEXT AND REFERENCE BOOKS:

1. Marjie T. Britz Computer Forensic & Cyber Crime : An Introduction.
2. Karnika Seth Cyber Laws in the Information Technology Age
3. Aparna Vishwanathan Cyber Law Indian and International Perspectives
4. Prof.Vimlendu Tayal Cyber Law ,Cyber Crime, Cyber Internet and ECommerce.
5. Marjie T. Britz, “Computer Forensics and Cyber Crime”, Pearson, 2013.
6. Garima Tiwari, “Understanding Laws– Cyber Laws And Cyber Crimes”, Lexis Nexis, 2014.
7. Chuck Easttom, Jeff Taylor, “Computer Crime, Investigation, and the Law”, Course Technology, 2018.
8. Eoghan Casey, “Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet”, Eoghan Casey, 2018

DATABASE AND CLOUD SECURITY

Semester	VI			
Course code				
Category	PEC			
Course title	Database and Cloud Security			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit

COURSE OBJECTIVES:

This course helps the students to understand the concepts of database and cloud with different methods of security.

COURSE OUTCOMES:

The course helps the students to

- CO1. Explain the role of security in the design and implementation of databases
- CO2. Use best practices for data input, output, and encryptions
- CO3. Maintain database management systems, including conducting security audits and keeping software updated
- CO4. Understand the apply the concepts of SQL Injection attacks
- CO5. Apply data protection in the cloud with different types of services

UNIT-I

Introduction to Database, Need of Database Security, Principles of Database Management Systems, Elements of Relational DBMS, SQL, SQL commands: DDL, DML and DCL

UNIT-II

SQL Injection Attacks and their types, SQLi Countermeasures, Techniques of Injection, Database Access Control: SQL-Based Access, Cascading Authorizations, Role Based Access Control, Inference, Database Encryption

UNIT-III

Introduction to Cloud Computing and its elements, Cloud Computing Reference Architecture, Cloud Computing Risks and countermeasures

UNIT-IV

Data Protection in the Cloud, Cloud Security as a Service, SaaS, PaaS, IaaS, Identity and Access management, Data loss prevention, Email security, security information and event management

TEXT AND REFERENCE BOOKS

1. Michael Gertz and Sushil Jajodia, "Handbook of Database Security— Applications and Trends", Springer, 2008.
2. Bryan and Vincent, "Web Application Security, A Beginners Guide ", McGraw-Hill, 2011
3. Bhavani Thuraisingham, "Database and Applications Security", Integrating Information Security and Data Management, Auerbach Publications, 2005.
4. Alfred Basta, Melissa Zgola, "Database Security", Course Technology, 2012.

MALWARE ANALYSIS AND REVERSE ENGINEERING

Semester	VI			
Course code				
Category	PEC			
Course title	Malware Analysis & Reverse Engineering			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			
Course Title	Malware Analysis & Reverse Engineering			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit

COURSE OBJECTIVES:

1. Participants will be able to perceive malware analysis with open source.
2. Able to analyze and recognize malware with basic analysis techniques, dynamic analysis techniques, and static analysis techniques

COURSE OUTCOMES:

- CO1. To build an isolated and controlled laboratory environment to analyze code and behaviour of malicious programs.
- CO2. To list up basic analysis techniques
- CO3. To reveal and do basic dynamic analysis of malicious JavaScript and other components of web pages, which are often used by exploit kits for drive-by attacks.
- CO4. To explain techniques of malicious code analysis, code debugging, malware debugging, and kernel debugging.
- CO5. To explain various features/packages of self-protected malware and other defence mechanisms designed by malware makers to direct, confuse, and slow down analysts.

UNIT-I

INTRODUCTION TO MALWARE:

What is malware, malware infection channels, introduction to malware analysis, purpose of analysis, step-by-step process of malware analysis, types of analysis, malware analysis stages/flow, virtual machine, virtual networks, tools of malware analysis and components of malware analysis, malware acquisition, malware defense

UNIT-II

STATIC AND DYNAMIC ANALYSIS:

Introduction to Static Analysis: File Types, Strings, File Hash, File Resource, DLL Imports, Sandbox, PE Headers, Timestamp and Packer Identification, Introduction to Dynamic Analysis: Network Monitoring, File System Monitoring, Windows Registry Monitor, Process Activity Monitoring, Sandboxing, Dynamic Analysis Tools

UNIT-III

MALWARE FUNCTIONALITY:

Code Debugging, Breakpoints, exceptions, User/Kernel Mode, Malware Behavior, Covert Malware Launching, Data Encoding, Malware-Focused Network Signatures

UNIT-IV

ANTI-REVERSE-ENGINEERING:

Introduction to Reverse Engineering, Anti Reverse Engineering, Anti-Disassembly, Anti-Debugging, Anti-Virtual Machine Techniques, Packers and Unpacking

TEXT AND REFERENCE BOOKS:

1. Michael Sikorski and Andrew Honig, "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software", No Starch Press, 2012.
2. Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software. Author(s): Michael Sikorski, Andrew Honig (Text book) https://repo.zenk-security.com/Virus-Infections-DetectionsPreventions/Practical_Malware_Analysis.pdf
3. Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware. Author(s): Monnappa K A
4. Mastering Malware Analysis, Author(s): Alexey Kleymenov, Amr Thabet
5. <https://zeltser.com/malware-analysis-cheat-sheet/>
6. <https://zeltser.com/analyzing-malicious-documents/>
7. <https://zeltser.com/remnux-malware-analysis-tips/>
8. <https://zeltser.com/malware-analysis-webcast/>

STEGANOGRAPHY & DIGITAL WATERMARKING

Semester	VI			
Course code				
Category	PEC			
Course title	Steganography & Digital Watermarking			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit

COURSE OBJECTIVES:

1. To develop an understanding of digital watermarking and steganography basics, various approaches, characteristics and application domains
2. To apply digital watermarking as an authentication tool for distribution of content over the Internet and steganography techniques for covert communication
3. To understand the basics of the counter measures like steganalysis for assessing the data hiding methods
4. To enable to evaluate and choose appropriate data hiding technique based on a multitude of security factors

COURSE OUTCOMES:

After completion of this course, the student shall be able to:

- CO1. Describe watermarking and steganography fundamental concepts and principles.
- CO2. Identify and assess different types of data hiding techniques in various image formats like GIF, BMP etc., and various data hiding methods like LSB, EzStego, OutGuess, and F5.
- CO3. Describe the block codes and its usage for covert communication
- CO4. Demonstrate the use of watermarking for copyright protection and steganography for secret communication in various digital media
- CO5. Design and implement efficient data hiding methods
- CO6. Assess the strength of any data hiding algorithm against steganalysis techniques.

UNIT- I

INTRODUCTION:

Information Hiding, Steganography, and Watermarking. History of Watermarking. History of Steganography, Importance of Digital Watermarking. Importance of Steganography.

UNIT- II

APPLICATIONS AND PROPERTIES OF WATERMARKING AND STEGANOGRAPHY:

Applications of Watermarking: Broadcast Monitoring, Owner Identification, Proof of Ownership, Transaction Tracking, Content Authentication, Copy Control, Device Control, Legacy Enhancement, Applications of Steganography: For Dissidents, for Criminals, Properties of Watermarking Systems: Embedding Effectiveness, Fidelity, Data Payload, Blind Detection, False Positive Rate, Robustness, security, Cipher and Watermark Keys, Evaluating Watermarking Systems: Benchmarking, Scope of Testing, Properties of Steganographic and Steganalysis Systems: Embedding Effectiveness, Fidelity, Data Payload, Blind Extraction, False Alarm Rate, Robustness, security, Stego Keys

UNIT- III

MODELS OF WATERMARKING:

Notation, Communications, Components of Communications Systems, Classes of Transmission Channels, Secure Transmission, Communication-Based Models of Watermarking, Basic Model, Watermarking as Communications with Side Information at the Transmitter, Watermarking as Multiplexed Communications, Geometric Models of Watermarking, Distributions and Regions in

Media Space, Marking Spaces, Modelling Watermark Detection by Correlation, Linear Correlation, Normalized Correlation, Correlation Coefficient

UNIT IV

STEGANOGRAPHY AND STEGANALYSIS:

Steganographic Communication: The Channel, The Building Blocks, Notation and Terminology, Information-Theoretic Foundations of Steganography, Cachin's Definition of Steganographic Security, Practical Steganographic Methods, Statistics Preserving Steganography, Model-Based Steganography, Masking Embedding as Natural Processing, Minimizing the Embedding Impact, Matrix Embedding, Nonshared Selection Rule, Steganalysis Scenarios, Detection, Forensic Steganalysis, The Influence of the Cover Work on Steganalysis, Some Significant Steganalysis Algorithms, LSB Embedding and the Histogram Attack, Sample Pairs Analysis, Blind Steganalysis of JPEG Images Using Calibration, Blind Steganalysis in the Spatial Domain.

TEXT AND REFERENCE BOOKS:

1. I. J. Cox, M. L. Miller, J. A. Bloom, T. Kalker, and J. Fridrich, Digital Watermarking and Steganography, 2nd Ed. Amsterdam: Morgan Kaufmann Publishers In, 2007. (ISBN No.: 978-0-12-372585-1)
2. J. Fridrich, Steganography in Digital Media: Principles, Algorithms, and Applications. Cambridge: Cambridge University Press, 2009. (ISBN No.: 978-0-52-119019-0)
3. R. C. Gonzalez, R. E. Woods, D. J. Czitrom, and S. Armitage, Digital Image Processing, 3rd Ed. United States: Prentice Hall, 2007. (ISBN No.: 978-0-13-168728-8)
4. P. Wayner, Disappearing Cryptography: Information hiding: Steganography and Watermarking, 3rd ed. Amsterdam: Morgan Kaufmann Publishers In, 2008. (ISBN No.: 978-0-08-092270-6)
5. M. Arnold, M. Schmucker, and S. D. Wolthusen, Techniques and applications of digital Watermarking and content protection, 2nd Ed. Boston, MA: Artech House Publishers, 2003. (ISBN No.: 978-1-58-053664-6)

**Professional
Elective
Course-III**

DATA MINING AND WAREHOUSING

Semester	VI			
Course code				
Category	PEC			
Course title	Data Mining and Warehousing			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

This course is designed to expand students' knowledge and skills gained in Data Mining and Warehousing courses and look in depth at data warehousing and data mining methods. The course examines the database architecture and technologies required for solving complex problems of data and information management, information retrieval, and knowledge discovery facing modern organizations. Case studies of organizations using these technologies to support business intelligence gathering and decision making are examined. This course also provides hands-on experience with state-of-the-art data warehousing and data mining methods and tools.

COURSE OUTCOMES:

After the completion of the course the students will be able

- CO1. To understand Concept of Data Mining, Data warehousing and schemas for multidimensional Databases.
- CO2. To understand Basic Statistics in order to apply data mining techniques.
- CO3. To analyse the data, identify the problems, and choose the relevant models and algorithms to apply.
- CO4. To combine and consolidate data from various databases scattered throughout a company into a Datawarehouse.
- CO5. To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

UNIT-I

BASIC STATISTICS:

Statistical descriptions of data: mean, median, mode, Measuring dispersion of data: range, quartiles, variance, standard deviation, chi-square test, Correlation coefficient and covariance, Regression analysis.

UNIT-II

DATA PREPROCESSING:

Introduction to Data preprocessing, Need to preprocess the data, Data cleaning: missing values, Data integration: Redundancy, Data reduction and its strategies, Data transformation and discretization, Strategies of data transformation.

UNIT-III

INTRODUCTION TO DATA MINING AND ITS ALGORITHMS:

Introduction to Data Mining and algorithms, Processes, Market Basket Analysis, The Apriori Algorithm, Decision Tree.

INTRODUCTION TO DATA WAREHOUSING AND DATA WRANGLING:

Data Warehouse, Difference between Operational Database systems and Data Warehouse, From Table and Spreadsheets to Data Cubes, Schemas for Multidimensional Databases: Star, Snowflakes and Fact Constellations, Data Wrangling, Combining and Merging DataSets, Reshaping and Pivoting, Data Transformation, String Manipulation, Regular Expressions (Regex)

UNIT-IV

ETL:

ETL Phase 1 Data Wrangling before the Load, ETL Phase 2 Step-by-step guide to uploading data using SSIS, Handling errors during ETL Phases 1,2, ETL Phase 3 Data Wrangling after the load, Handling errors during ETL Phase 3, Different types of ETL tools.

TEXT AND REFERENCE BOOKS:

1. Jiawei Han, Micheline Kamber and Jian Pei, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.
2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007
3. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006
4. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

SOFTWARE TESTING AND PROJECT MANAGEMENT

Semester	VI			
Course code				
Category	PEC			
Course title	SOFTWARE TESTING AND PROJECT MANAGEMENT			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit

COURSE OBJECTIVES:

1. This course introduces the concepts and methods required for the construction of large software intensive systems.
2. The course aims is to develop a broad understanding of the discipline of software engineering and management of software systems.
3. This course provides an understanding of both theoretical and methodological issues involve in modern software engineering project management and focuses strongly on Practical techniques.

COURSE OUTCOMES:

Upon the completion of the course students will be able to :

- CO1. Apply the process to be followed in the software development life-cycle models.
- CO2. Implement communication, modeling, construction & deployment practices in software development.
- CO3. Analyze & design the software models using unified modeling language (UML)
- CO4. Explain the concepts of various software testing methods & be able to apply appropriate testing approaches for development of software
- CO5. Explain the quality management & different types of metrics used in software development.
- CO6. Apply the concepts of project management & planning.

UNIT-I

SOFTWARE TESTING INTRODUCTION:

Introduction to Software Testing: Introduction, Evolution of Software Testing, Software Testing—Myths and Facts, Goals of Software Testing, Psychology for Software Testing, Software Testing Definitions, Model for Software Testing, Effective Software Testing vs. Exhaustive Software Testing, Effective Testing is Hard, Software Testing as a Process, Software Testing Terminology, Software Testing Life Cycle (STLC), Software Testing Methodology

UNIT-II

TESTING TECHNIQUES:

Dynamic Testing: Black-Box Testing Techniques, Boundary Value Analysis (BVA), Equivalence Class Testing, State Table-Based Testing, Decision Table-Based Testing, Cause-Effect Graphing Based Testing, Error Guessing, Dynamic Testing: White-Box Testing Techniques, Need of White-Box Testing, Logic Coverage Criteria, Basis Path Testing, Graph Matrices, Loop Testing, Data Flow Testing, Mutation Testing

Static Testing, Inspections, Structured Walkthroughs, Technical Reviews, Validation Activities, Unit Validation Testing, Integration Testing, Function Testing System Testing, Acceptance Testing

UNIT-III

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT (SPM):

Definition of a Software Project (SP), SP Vs. other types of projects activities covered by SPM, categorizing SPs, project as a system, management control, requirement specification, information and control in organization.

Stepwise Project planning: Introduction, selecting a project, identifying project scope and objectives, identifying project infrastructure, analyzing project characteristics, identifying project products and activities, estimate efforts each activity, identifying activity risk, allocate resources, review/ publicize plan.

UNIT-IV

PROJECT EVALUATION & ESTIMATION:

Cost benefit analysis, cash flow forecasting, cost benefit evaluation techniques, risk evaluation. Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods, rapid application development, water fall, V-process, spiral models. Prototyping, delivery. Albrecht function point analysis. Activity planning & Risk Management: Objectives of activity planning, project schedule, projects and activities, sequencing and scheduling activities, network planning model, representation of lagged activities, adding the time dimension, backward and forward pass, identifying critical path, activity throat, shortening project, precedence networks. Risk Management: Introduction, the nature of risk, managing risk, risk identification, risk analysis, reducing the risks, evaluating risks to the schedule, calculating the z values.

TEXT AND REFERENCE BOOKS:

1. Software Testing: Principles and Practices by Naresh Chauhan
2. Software Project Management (2nd Edition), by Bob Hughes and Mike Cotterell, 1999, TMH
3. Software Engineering – A Practitioner’s approach, Roger S. Pressman (5th ed), 2001, MGH
4. Software Project Management, Walker Royce, 1998, Addison Wesley.
5. Managing Global software Projects, Ramesh, 2001, TMH.
6. Gill, Nasib Singh: Software Engineering, Khanna Book Publishing Company(Private) Limited, New Delhi.

SOCIAL NETWORK ANALYSIS

Semester	VI			
Course code				
Category	PEC			
Course title	SOCIAL NETWORK ANALYSIS			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit

COURSE OBJECTIVES:

This course covers data analysis on social networks, focusing on ways to handle large-scale networks efficiently. It provides the main theoretical results in social network mining as well as hands-on practice on key issues in the area.

COURSE OUTCOMES:

By completing the course, the students will be able to:

- CO1. understand the basic concepts of social networks
- CO2. understand the fundamental concepts in analyzing the large-scale data that are derived from social networks
- CO3. implement mining algorithms for social networks
- CO4. perform mining on large social networks and illustrate the results.
- CO5. Applying the concepts of social network on various web applications and analyze the trend of interactions

UNIT-I

INTRODUCTION TO SOCIAL NETWORK MINING, GRAPH MODELS AND NODE METRICS:

Introduction to social network mining. Illustration of various social network mining tasks with real-world examples. Data characteristics unique to these settings and potential biases due to them, Social Networks as Graphs, Random graph models/ graph generators, power law, preferential attachment, small world, stochastic block models, degree distributions. Models of evolving networks, Node based metrics, ranking algorithms (Pagerank), Gephi graph visualization and exploration software – practice.

UNIT-II

SOCIAL-NETWORK GRAPH ANALYSIS

Social network exploration/ processing: graph kernels, graph classification, clustering of social-network graphs, centrality measures, community detection and mining, degeneracy (outlier detection and centrality), partitioning of graphs.

UNIT-III

SOCIAL-NETWORK GRAPH ANALYSIS AND PROPERTIES

Social network exploration/ processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighborhood properties of graphs.

UNIT-IV

INFORMATION DIFFUSION IN SOCIAL NETWORKS

Strategic network formation: game theoretic models for network creation/ user behavior in social networks. Information diffusion in graphs: Cascading behavior, spreading, epidemics, heterogeneous social network mining, influence maximization, outbreak detection. Opinion analysis on social networks: Contagion, opinion formation, coordination and cooperation, Dynamic Social Networks,

Applications and Research Trends: Dynamic social networks, Link prediction, Social learning on networks, Special issues in Information and Biological networks, Important applications of social network mining related to the above topics. Research trends.

TEXT AND REFERENCE BOOKS:

1. David Easley and Jon Kleinberg, Networks, crowds, and markets, Cambridge University Press, 2010.
2. Jure Leskovec, Anand Rajaraman and Jeffrey David Ullman, Mining of massive datasets, Cambridge University Press, 2014.

CRYPTOCURRENCY WITH ETHEREUM

Semester	VI			
Course code				
Category	Professional Elective Courses			
Course title	Cryptocurrency With Ethereum			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To introduce the concepts of cryptocurrency.
2. To understand working of Bitcoin and Ethereum
3. To study the security issues and safeguards related to bitcoin trading
4. To study governing cryptocurrency regulations and its impact on economy.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Cryptocurrency: Bitcoin and Ethereum

CO2: Building efficient blockchain models to carry out tasks with the practical approach.

CO3: Evaluating the use and risks involved with cryptocurrency

CO4: Learning Smart contracts and their implications

UNIT - I

CRYPTOCURRENCY: History, Distributed Ledger Technology (DLT), cryptocurrency in blockchain, Cryptographic basics for cryptocurrency: overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography.

UNIT - II

BITCOIN: Creation of coins, Wallet, Genesis Block, Merkel Tree, Bitcoin Scripts, Bitcoin P2P Network, hardness of mining, Transaction in Bitcoin Network, transaction verifiability, anonymity, forks, payments and double spending, Consensus in a Bitcoin network, mathematical analysis of properties of Bitcoin, Bitcoin protocols – Bitcoin Mining strategy and rewards, life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT - III

ETHEREUM: Ethereum Virtual Machine (EVM), Wallets for Ethereum, Ethereum Programming Language: Solidity, Smart Contracts, The turing completeness of smart contract languages, attacks on smart contracts, Ethereum Construction, DAO, GHOST, Vulnerability, Attacks, Sidechain: another type of blockchain, Namecoin

UNIT - IV

CRYPTOCURRENCY REGULATION: Stakeholders, Roots of Bitcoin, Bitcoin scripting vs Ethereum smart contracts, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy, Global Acceptability perspective.

TEXT AND REFERENCE BOOKS:

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton University Press (July 19, 2016).
2. Mastering Bitcoin: Unlocking Digital Cryptocurrencies by Antonopoulos
3. Bitcoin: A Peer-to-Peer Electronic Cash System by Satoshi Nakamoto
4. ETHEREUM: A Secure Decentralized Transaction Ledger by Gavin Wood, Yellow paper.2014.
5. A survey of attacks on Ethereum smart contracts by Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli

7TH

SEMESTER

B.Tech. Computer Science and Engineering (Cyber Security) Scheme of Studies/Examination Semester VII

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Text and Web Intelligence	3	0	0	3	30	70	100
2	LC		Text and Web Intelligence (P)	0	0	2	1	50	50	100
3	PCC		Digital Forensics	3	0	0	3	30	70	100
4	PEC		Professional Elective-IV	3	0	0	3	30	70	100
5	OEC		Open Elective-III	3	0	0	3	30	70	100
6	OEC		Open Elective-IV	3	0	0	3	30	70	100
7	Project		Project-II	0	0	8	4	100	100	200
8	Training		Practical Training-II	0	0	2	1	50	50	100
Total				15	0	12	21			900

NOTE:

- The evaluation of Practical Training - II will be based on the seminar, viva voice, and report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded an 'F' grade is required to repeat Practical Training.

A	Excellent
B	Good
C	Satisfactory
F	Not Satisfactory

- Choose any one from Professional Elective Course – IV
- Choose any one from Open Elective Course – III and IV *

Professional Elective Course – IV

- Ethical Hacking
- Information Security Risk Assessment
- Wireless and Mobile security
- Wireless sensor networks

Open Elective Course – III & IV: To be chosen from the bucket of Open Elective-III & IV

TEXT AND WEB INTELLIGENCE

Semester	VII				
Course code					
Category	Professional Core Courses				
Course title	Text and Web Intelligence				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Understand the fundamentals of information retrieval systems and its technologies
2. Process structured and unstructured data
3. Mining text and learning different analyzing techniques
4. Learning different techniques for textual and nontextual data

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1. To understand the concepts of Boolean retrieval utilized in Information retrieval system and acquire the ability to Process Unstructured Data.
- CO2. To get an overview of text mining and analytics with different techniques of finding similarity.
- CO3. To comprehend the building and evaluation of Supervised and Unsupervised Categorization Models.
- CO4. To analyse the concepts of opinion and sentiment analysis
- CO5. To apply the techniques for joint mining textual and non-textual data.

UNIT - I

INTRODUCTION AND DATA PREPROCESSING:

Introduction to the course, Introduction with example of Information retrieval problem, Boolean Retrieval (Term Incidence Matrix, Inverted Index, Dictionary-Postings list, Processing Boolean Queries, Skip Pointers), Preprocessing steps (Tokenization, stop word removal, normalization, stemming, lemmatization, part of speech tagging), wildcard queries

UNIT - II

OVERVIEW OF TEXT MINING AND ANALYTICS:

Overview of Text Mining and Analytics, Paradigmatic Relation Discovery, syntagmatic relation discovery, cosine similarity, tf-idf calculation, PLSA, LDA

UNIT - III

SENTIMENT ANALYSIS AND OPINION MINING:

Introduction to Sentiment Analysis, sentiment classification, opinion mining. Python NLTK Sentiment Analysis, Recommendation Systems and its working

UNIT - IV

CASCADING AND DIFFUSION IN NETWORKS:

Introduction to web Analytics, Web mining process and techniques- data collection, web scraping,

Ranking Techniques: Page Rank and HITS

TEXT AND REFERENCE BOOKS:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, Introduction to Information Retrieval, Cambridge University Press, 2008
2. Tony Ojeda, Rebecca Bilbro, Benjamin Bengfort, Applied Text Analysis with Python, O'Reilly Media, June 2018.
3. Web Analytics for dummies, by Pedro Sostr and Jennifer LeClaire, Wiley Publishing, Inc.
4. Ashok N. Shrivastva, Mehran Sahami, Text Mining: Classification, Clustering and Applications; CRC Press, edition 2010.

DIGITAL FORENSICS

Semester	VII				
Course code					
Category	Professional Core Courses				
Course title	Digital Forensics				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
2. To understand how to examine digital evidences such as the data acquisition, identification analysis

COURSE OUTCOMES:

- CO1. To apply forensic analysis tools to recover important evidence for identifying computer crime.
- CO2. To be well-trained as next-generation computer crime investigators.
- CO3. To collect forensics data and analyze them
- CO4. To validate and test forensic tools on real-life data
- CO5. To understand wireless and mobile forensic techniques

UNIT - I

COMPUTER FORENSICS FUNDAMENTALS:

What is Computer Forensics?, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer Forensics Technology: - Types of Business Computer Forensic Technology. Types of Military Computer Forensic Technology, Types of Law Enforcement- Computer Forensic Technology, Types of Business Computer Forensic Technology. Computer Forensics Evidence and capture: Data Recovery Defined-Data Back-up and Recovery-The Role of Back -up in Data Recovery-The Data -Recovery Solution.

UNIT - II

EVIDENCE COLLECTION AND DATA SEIZURE:

Why Collect Evidence? Collection Options, Obstacles-Types of Evidence-The Rules of Evidence-Volatile Evidence-General Procedure-Collection and Archiving-Methods of Collections-Art facts-Collection Steps -Controlling Contamination: The chain of custody. Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene-Computer Evidence processing steps-Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication - Practical Consideration-Practical Implementation.

UNIT - III

COMPUTER FORENSIC ANALYSIS AND VALIDATION:

Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions Network Forensics: Network forensic overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project. Processing crime at incident scenes: Identifying digital evidence, collecting

evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.

UNIT - IV

CURRENT COMPUTER FORENSIC TOOLS:

Evaluating computer forensic tool needs, computer forensic software tools, computer forensic hardware tools, validating and testing forensic software. E-mail investigations: Exploring the role of email in investigations, exploring the role of client and server in email, investigating email crimes and violations, understanding email servers, using specialized email forensic tools. Cell phone and mobile device forensics: Understanding mobile device forensic, understanding acquisition procedures for cell phones and mobile devices.

TEXT AND REFERENCE BOOKS:

1. Computer Forensics, Computer Crime Investigation by John R, Vacca, Firewall Media, New Delhi.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning.
3. Real Digital Forensics by Keith j. Jones, Richard Bejtitlich, Curtis W. Rose, Addison Wesley Pearson Education
4. Forensic Compiling, A Tractitioner is Guide by Tony Sammes and Brain Jenkinson, Springer International edition.
5. Computer Evidence Collection & Presentation by Chrostopher L.T. Brown, Firewall Media.
6. Homeland Security, Techniques & Technologies by Jesus Mena, Firewall Media.
7. Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M. Slade ,TMH 2005
8. Windows Forensics by chad Steel, Wiley India Edition.

TEXT AND WEB INTELLIGENCE LAB

Semester	VII				
Course code					
Category	Lab Courses				
Course title	Text and Web Intelligence Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OUTCOMES:

- CO1. Apply the basic concepts of Web mining using NLTK
- CO2. Utilizing regular expression to retrieve and mining information
- CO3. To understand and apply different stemming and lemmatization techniques
- CO4. To capture and contrast different clustering methodologies
- CO5. To work on HTML markups

EXPERIMENTS

1. Consider the input string - "Joe waited for the train. The train was late. Mary and Samantha took the bus. I looked for Mary and Samantha at the bus station."
 - Write a Python NLTK program to split the text sentence/paragraph into a list of words.
 - Write a Python NLTK program to create a list of words from a given string. Consider same input as in the previous question.
 - Write a Python NLTK program to split all punctuation into separate tokens.
2. Write a Python NLTK program to tokenize words, sentence wise.
3. Write a Python NLTK program to remove Twitter username handles from a given twitter text. Consider input string as: "@abcd @pqrsNoSQL introduction - w3resource http://bit.ly/1ngHC5F #nosql #database #webdev".
4. Write a Python NLTK program to find parenthesized expressions in a given string and divide the string into a sequence of substrings.
5. Use PorterStemmer() to perform Stemming on the list. Input = ["program", "programs", "programer", "programing", "programers"]
6. Apply SnowballStemmer on the previous input.
7. Perform lemmatization on the list. Input = ["program", "programs", "programer", "programing", "programers"]
8. Write a program to strip away HTML markup with the help of the BeautifulSoup library, and use regular expressions to remove open and close double brackets and anything in between them.
9. Write a program to Normalize the data and remove non-ASCII characters from a list of normalized tokens.
10. Write a program to remove accented characters

PRACTICAL TRAINING - II

Semester	VII				
Course code					
Category	Professional Core Courses				
Course title	Practical Training - II				
Scheme and Credits	L	T	P	Credits	
	0	0	1	1	
Internal Assessment	50				
External Assessment	50				
Total	100				
Duration of Exam	-				

The evaluation of Practical Training - II will be based on the seminar, viva voice, and report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded an 'F' grade is required to repeat Practical Training.

A	Excellent
B	Good
C	Satisfactory
F	Not Satisfactory

PROJECT - II

Semester	VII				
Course code					
Category	Professional Core Courses				
Course title	Project - II				
Scheme and Credits	L	T	P	Credits	
	0	0	6	3	
Classwork	100 Marks				
Exam	100 Marks				
Total	200 Marks				
Duration of Exam	03 Hours				

COURSE OUTCOMES:

- CO1. To prepare the student to gain major design and or research experience as applicable to the profession
- CO2. Apply knowledge and skills acquired through earlier coursework in the chosen project.
- CO3. Make conversant with the codes, standards, application software and equipment
- CO4. Carry out the projects within multiple design constraints
- CO5. Incorporate multidisciplinary components
- CO6. Acquire the skills of comprehensive report writing

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.

The project will have 4 stages:

(*Marks for internal evaluation are given in brackets)

1. Synopsis submission (10 marks)
2. 1st mid-term progress evaluation (10 marks)
3. 2nd mid-term progress evaluation (10 marks)
4. Final submission evaluation (20 marks)

The external examiner will evaluate the project based on idea/quality of project, implementation of the project, project report and viva

Professional Elective-IV

ETHICAL HACKING

Semester	VII				
Course code					
Category	Professional Elective Course				
Course title	Ethical Hacking				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
2. The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

COURSE OUTCOMES:

- CO1. To gain the knowledge of the use and availability of tools to support an ethical hack
- CO2. To gain the knowledge of interpreting the results of a controlled attack
- CO3. To understand the role of politics, inherent and imposed limitations and metrics for planning of a test
- CO4. To comprehend the dangers associated with penetration testing
- CO5. To understand the concepts of reconnaissance and its applications

UNIT - I

INTRODUCTION: HACKING IMPACTS, THE HACKER:

Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration. Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking.

UNIT - II

THE BUSINESS PERSPECTIVE: Business Objectives, Security Policy, Previous Test Results, Business Challenges. Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement.

UNIT - III

PREPARING FOR A HACK: Technical Preparation, Managing the Engagement. Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance.

UNIT - IV

ENUMERATION: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase. Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern.

TEXT AND REFERENCE BOOKS:

1. James S. Tiller, “The Ethical Hack: A Framework for Business Value Penetration Testing”, Auerbach Publications, CRC Press.
2. EC-Council, “Ethical Hacking and Countermeasures Attack Phases”, Cengage Learning.
3. Michael Simpson, Kent Backman, James Corley, “Hands-On Ethical Hacking and Network Defense”, Cengage Learning.

INFORMATION SECURITY RISK ASSESSMENT

Semester	VII				
Course code					
Category	Professional Elective Course				
Course title	Information Security Risk Assessment				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To study different concepts of IT security and their management
2. To introduce the terminology, technology and its applications of IT security
3. To enable a clear understanding and knowledge of Security Analyst foundations
4. To introduce the tool, technologies and programming languages which is used in day to day security analyst job role.

COURSE OUTCOMES:

- CO1. Understanding the difference between Security Metrics and Audits.
- CO2. Applying knowledge on Vulnerability Management
- CO3. Analyzing the Information Security Audit Tasks, Reports and Post Auditing Actions
- CO4. Understanding Information Security Assessments
- CO5. Applying measures of physical and infrastructure security

UNIT-I

IT SECURITY MANAGEMENT AND RISK ASSESSMENT:

IT Security Management, Organizational Context and Security Policy, Security Risk Assessment, Detailed Security Risk Analysis, Case Study: Silver Star Mines

UNIT-II

IT SECURITY CONTROLS, PLANS, AND PROCEDURES:

IT Security Management implementations, Security Controls or Safeguards, IT Security Plans, Implementation of Controls, Monitoring Risks, Case Study: Silver Star Mines

UNIT-III

PHYSICAL AND INFRASTRUCTURE SECURITY:

Overview, Physical security Threats, Physical Security Prevention and Mitigation Measures, Recovery from Physical Security Breaches, Integration of Physical and logical Security, Security Awareness, training and Education, E-mail and Internet Use Policies, Computer Security Incident Response Teams

UNIT-IV

SECURITY AUDITING:

Security Auditing Architecture, security Audit Trail, Implementing Logging Function, Audit Trail Analysis, Example: An Integrated Approach.

TEXT AND REFERENCE BOOKS:

1. Assessing Information Security (strategies, tactics, logic and framework) by A Vladimirov, K.Gavrilenko, and A.Michajlowski
2. “The Art of Computer Virus Research and Defense by Peter Szor.”
3. <https://www.sans.org/readingroom/whitepapers/threats/implementing-vulnerability-management-process-34180>
4. <http://csrc.nist.gov/publications/nistpubs/800-40-Ver2/SP800-40v2.pdf>

WIRELESS AND MOBILE SECURITY

Semester	VII				
Course code					
Category	Professional Elective Course				
Course title	Wireless and Mobile Security				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

This skill oriented course equips the system Administrators with the skills required to protect & recover the computer systems & networks from various security threats.

COURSE OUTCOMES:

By the end of the course Students will

- CO1. Familiarize with the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks.
- CO2. Gain knowledge and understanding of the various ways in which wireless networks can be attacked and tradeoffs in protecting networks.
- CO3. Have a broad knowledge of the state-of-the-art and open problems in wireless and mobile security, thus enhancing their potential to do research or pursue a career in this rapidly developing area.
- CO4. Learn various security issues involved in cloud computing.
- CO5. Learn various security issues related to GPRS and 3G.

UNIT-I

SECURITY ISSUES IN MOBILE COMMUNICATION: Mobile Communication History, Security – Wired Vs Wireless, Security Issues in Wireless and Mobile Communications, Security Requirements in Wireless and Mobile Communications, Security for Mobile Applications, Advantages and Disadvantages of Application – level Security.

UNIT-II

SECURITY OF DEVICE, NETWORK, AND SERVER LEVELS: Mobile Devices Security Requirements, Mobile Wireless network level Security, Server Level Security. Application Level Security in Wireless Networks: Application of WLANs, Wireless Threats, Some Vulnerabilities and Attach Methods over WLANs, Security for 1G Wi-Fi Applications, Security for 2G Wi-Fi Applications, Recent Security Schemes for Wi-Fi Applications

UNIT-III

APPLICATION LEVEL SECURITY IN CELLULAR NETWORKS: Generations of Cellular Networks, Security Issues and attacks in cellular networks, GSM Security for applications, GPRS Security for applications, UMTS security for applications, 3G security for applications, Some of Security and authentication Solutions.

UNIT-IV

APPLICATION LEVEL SECURITY IN MANETS: MANETs, Some applications of MANETs, MANET Features, Security Challenges in MANETs, Security Attacks on MANETs, External Threats for MANET applications, Internal threats for MANET Applications, Some of the Security Solutions.

Ubiquitous Computing, Need for Novel Security Schemes for UC, Security Challenges for UC, and Security Attacks on UC networks, Some of the security solutions for UC.

TEXT AND REFERENCE BOOKS:

1. Pallapa Venkataram, Satish Babu: “Wireless and Mobile Network Security”, 1st Edition, Tata McGraw Hill, 2010.
2. Frank Adelstein, K.S.Gupta : “Fundamentals of Mobile and Pervasive Computing”, 1st Edition, Tata McGraw Hill 2005.
3. Randall k. Nichols, Panos C. Lekkas : “Wireless Security Models, Threats and Solutions”, 1st Edition, Tata McGraw Hill, 2006.
4. Bruce Potter and Bob Fleck : “802.11 Security” , 1st Edition, SPD, O’REILLY 2005.
5. James Kempf: “Guide to Wireless Network Security, Springer. Wireless Internet Security – Architecture and Protocols”, 1st Edition, Cambridge University Press, 2008.

WIRELESS SENSOR NETWORKS

Semester	VII				
Course code					
Category	Professional Elective Course				
Course title	Wireless Sensor Networks				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To make students understand the basics of Wireless sensor Networks.
2. To familiarize with learning of the Architecture of WSN.
3. To understand the concepts of Networking and Networking in WSN.
4. To study the design consideration of topology control and solution to the various problems.
5. To introduce the hardware and software platforms and tool in WSN

COURSE OUTCOMES:

- CO1. By the end of the course Students will be able to:
- CO2. Understand challenges and technologies for wireless networks
- CO3. Understand architecture and sensors
- CO4. Describe the communication, energy efficiency, computing, storage and transmission
- CO5. Establishing infrastructure and simulations
- CO6. Explain the concept of programming the in WSN environment

UNIT – I

OVERVIEW OF WIRELESS SENSOR NETWORKS:

Single-Node Architecture - Hardware Components - Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks - Types of wireless sensor networks.

UNIT – II

ARCHITECTURES:

Network Architecture - Sensor Networks- Scenarios - Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts, Operating Systems and Execution Environments - introduction to Tiny OS and nesC - Internet to WSN Communication.

UNIT – III

NETWORKING SENSORS:

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts – SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy- Efficient Routing, Geographic Routing.

UNIT - IV

INFRASTRUCTURE ESTABLISHMENT:

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

TEXT AND REFERENCES BOOKS:

1. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Waltenegus Dargie , Christian Poellabauer, "Fundamentals of Wireless Sensor Networks - Theory and Practice", John Wiley & Sons Publications, 2011
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.
5. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003

8th

SEMESTER

**B.Tech. Computer Science and Engineering
(Cyber Security)
Scheme of Studies/Examination
Semester VIII**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		MOOC-1	3	0	0	3	30	70	100
2	PCC		MOOC-2	3	0	0	3	30	70	100
3	PROJ		Project III/Industrial Project	0	0	16	8	150	150	300
Total				06		16	14	210	290	500

PROJECT - III

Semester	VIII			
Course code				
Category	Professional Core Courses			
Course title	Project - III			
Scheme and Credits	L	T	P	Credits
	0	0	20	10
Classwork	150 Marks			
Practical	150 Marks			
Total	300 Marks			
Duration of Exam	03 Hours			

COURSE OBJECTIVES:

1. To prepare the student to gain major design and or research experience as applicable to the profession
2. Apply knowledge and skills acquired through earlier coursework in the chosen project.
3. Make conversant with the codes, standards, application software and equipment
4. Carry out the projects within multiple design constraints
5. Incorporate multidisciplinary components
6. Acquire the skills of comprehensive report writing

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.

The project will have 4 stages:

(*Marks for internal evaluation are given in brackets)

1. Synopsis submission (10 marks)
2. 1st mid-term progress evaluation (10 marks)
3. 2nd mid-term progress evaluation (10 marks)
4. Final submission evaluation (20 marks)

The external examiner will evaluate the project based on idea/quality of project, implementation of the project, project report and viva.

MOOC - I

Semester	VIII				
Course code					
Category	Engineering Science Course				
Course title	MOOC - I				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	-				
Practical	-				
Total	100 Marks				
Duration of Exam	-				

A student has to complete NPTEL Courses of 12 Weeks respectively through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site <http://nptel.ac.in/> as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MOOCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only.

MOOC - II

Semester	VIII				
Course code					
Category	Engineering Science Course				
Course title	MOOC - II				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	-				
Practical	-				
Total	100 Marks				
Duration of Exam	-				

A student has to complete NPTEL Courses of 12 Weeks respectively through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site <http://nptel.ac.in/> as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MOOCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only.

Chapter 4 Guidelines for Assessment of Theory Courses

Assessment tools for theory courses

The overall direct and indirect tools of assessment for theory courses are given below.

Assessment Tools for Theory Courses		
Direct Tools		
Sr No.	Description of the tool	COs Covered
1	Sessional Examination I	Questions must cover at least first three Levels of COs. (Remember, Understand, Apply)
2	Sessional Examination II	Questions must cover at least four Levels of COs including the first three levels (Remember, Understand, Apply).
3	Internal Examination III (Open Book Mode)	Last four levels of COs (Apply, Analyse, Evaluate, Create)
4	Assignment I	Last Three Levels of COs (Analyse, Evaluate, Create)
6	Assignment II	Last Two Levels of COs (Evaluate and Create)
7.	Attendance/Level of Participation in Class	Learning Curve and Communication
8.	Final Examination	Possibly Covering all levels of COs
Indirect Tools		
1.	End-Semester Survey	Covering all levels of COs
2.	Exit Survey	Covering all POs

Guidelines for internal evaluation

1. All the teachers are required to set questions sessional/minor exams according to the COs and the level of CO needs to be mentioned against each question.
2. The three minor examinations together must cover all the levels of COs.
3. It is compulsory to give two assignments during the semester pertaining to the last three levels of COs.
4. The sessional/minor examination answer sheet must be evaluated as per the COs.
5. All the teachers are required to maintain the internal evaluation record according the COs
6. All the teachers are required to submit the internal evaluation record along with the computation of attainment levels of COs.
7. The respective proformas for making sessional/ minor question papers, maintaining CO-wise evaluation record of the course and submitting the CO attainment levels are given next in this chapter.
8. For the purpose of internal assessment, the average of the highest marks obtained by a student in any of the two minor examinations will be considered. Class Performance will be measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks).

**Department of Computer Science and Engineering
Gurugram University, Gurugram-122018**

Sample Detailed Direct Tools for Internal Assessment

The sessional exams must contain four questions.					
	Question No.	Question No. 1	Question No. 2	Question No. 3	Question No. 4
Sessional 1	Levels of Bloom's Taxonomy	First level: Remember	Second level: Understand	Third Level: Apply	Any of these levels (3, 4, 5) Apply, Analyse, Evaluate
	Marks Distribution	4	4	6	6
	No. of Questions	Question No. 1	Question No. 2	Question No. 3	Question No. 4
Sessional 2	Levels of Bloom's Taxonomy	First level: Remember	Second level: Understand	Third Level: Apply	Any of these levels: (4, 5, 6) Analyse, Evaluate, Create
	Marks Distribution	4	4	6	6
	No. of Questions	Question No. 1	Question No. 2	Question No. 3	Question No. 4
Internal Examination	Levels of Bloom's Taxonomy	Third level: Apply	Any one out of fourth and fifth levels: Analyse, Evaluate	Any one out fifth and sixth levels: Evaluate	Last level: Create
	Marks Distribution	4	4	6	6
	No. of Questions	Question No. 1	Question No. 2	Question No. 3	Question No. 4
Assignment 1	Must be based on the last three levels For purpose of computing CO attainment level only (10 Marks)				
Assignment 2	Must be based on the last two levels For purpose of computing CO attainment level only (10 Marks)				
Industrial Training	Based on the last four levels				
Industrial Training/Mini Project	Based on the last four levels				
Major Project	Based on the last four levels				

Note: The course coordinator may make slight modification in the style of minor examinations as per the requirement the course. The due weightage to higher level COs must be maintained in all respects.

**Department of Computer Science and Engineering
Gurugram University, Gurugram-122018**

Record of CO-wise Internal Assessment

Name of the Programme:																		Semester:					
Nomenclature of the Course:																		Course Code:					
Details of Students		Minor I					Minor II						Minor 3				AI (CO5)	AII (CO6)	Overall Attainment				
Roll. No.	Name	Q1 CO1 4	Q2 CO2 4	Q3 CO3 6	Q4 CO4 6	- CO5	Q1 CO1 4	Q2 CO2 4	Q3 CO3 6	Q4 CO4 6	- CO5 6	- CO6	Q1 CO3 4	Q2 CO4 4	Q3 CO5 6	Q4 CO6 6	10	10	CO1	CO2	CO3	CO4	CO5
101	-	3	3	4	4	-	4	3	5		4		3	2	4	3	5	4	7/8 0.85	6/8 0.80	12/16 0.75	6/110 0.73	4/6 0.77
102	-																		-	-	-	-	-
103	-																		-	-	-	-	-
104	-																		-	-	-	-	-
% student getting more than 55 % marks																			0.82	0.78	0.72	0.65	0.60
Attainment Levels																			3	3	3	2	1
Name of the Course Coordinator																		Signature of the Course Coordinator					

Max marks for COs: CO1:8; CO: 8; CO3=16; CO4=10; CO5=22, CO6=16.

Criteria for Computing Attainment Level

Attainment Level - (None): Below 60% of students score more than 55% marks out of the maximum relevant marks.
 Attainment Level 1 (low): 60% of students score more than 55% marks out of the maximum relevant marks.
 Attainment Level 2 (Medium): 70% of students score more than 55% marks out of the maximum relevant marks.
 Attainment Level 3 (high): 80% of students score more than 55% marks out of the maximum relevant.

Sample Overall Attainment Level of COs for Data Structures and Algorithms Course	
List of Course Outcomes	Level of attainment
CO1. list or describe types of data structures and operations that can be implemented on these data structures.	3
CO2. Demonstrate the use of various data structure and their related operations	3
CO3. Apply appropriate data structures with respect to effective storage of data and efficiency of the required operations on data for solving real world problems.	3
CO4. Analyse the time complexity of searching and algorithms.	2
CO5. formulate data structures and prescribe operations for given real world situations.	1

Note: The class coordinators need to submit the course outcome attainment levels as given in the table above.

Chapter 5: Guidelines

Internal and external

Assessment of Lab. Courses

Assessment Tools for Lab. Courses

The assessment tools for evaluating lab. courses are given below. The total lab evaluation marks: 100 (Internal: 50; External 50)

Assessment Tools for Lab. Courses		
Direct Tools		
Sr No.	Description of the tool	COs Covered
1	Assignments	10 to 15 assignments based on the last four levels of COs (Apply, Analyse, Evaluate, Create)
2.	Group Assignment (s)	Last three levels of COs (Analyse, Evaluate, Create)
3.	Laboratory Evaluations (MLE) I and II (Each of 50 marks) (implementing a problem, lab. record, VIVA-VOCE, use of ethical practices, self-learning and group spirit	Last four levels of COs (Apply, Analyse, Evaluate, Create)
4.	External Examination (50 Marks) (implementing a problem, lab. record, VIVA-VOCE, use of ethical practices	Last four levels of COs (Apply, Analyse, Evaluate, Create)
Indirect Tools		
1.	End-Semester Survey	Covering all levels of COs
2.	Exit Survey	Covering all POs

Guidelines for internal and external evaluation of lab. courses:

1. The internal evaluation MEA I and MEA II will be conducted in the week before or after the internal minor examinations for the theory courses by the course coordinator.
2. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable.
3. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations.
4. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.
5. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations.
6. The internal lab practical examination is to be conducted strictly on the pattern of external practical examination.
7. The evaluation must be conducted to measure the attainment level of COs
8. The proforma for break-up of marks for internal and external lab. course evaluations are given next in this chapter.
9. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department.
10. For implementing the spirit of continuous evaluation, the course coordinators will maintain the experiment-wise record of the performance of students for the laboratory courses as a part of their lab course file.
11. The course coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the prescribed proformas to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch.
12. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the course outcomes of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

**Department of Computer Science and Engineering
Gurugram University, Gurugram-122018**

Internal Laboratory Course Evaluation Proforma

Laboratory Course Evaluation-I (LE-I) / Laboratory Course Evaluation-II (LE-II)

Name of the Programme:

Semester:

Nomenclature of the Course:

Course Code:

SR. No.	Roll. No.	Written work and/or conduct of experiment(s)	(VIVA-VOCE) based on laboratory course outcomes from CO2 to CO4			Laboratory Record/ File.	Class Performance (Attendance/ Ethical practices followed, Self-Learning and Team Spirit)	Total
			CO1	CO2	CO3			
1								
2								
3								
.								
.								
Total No. of Students			Present:			Absent		
Name of the Course Coordinator				Signature of the Course Coordinator				
Note: The CO-wise weightage be decided as per the requirement of the Lab Course by the Course Coordinator in consultation with the Chairperson.								

**Department of Computer Science and Engineering
Gurugram University, Gurugram-122018**

External Laboratory Course Evaluation Proforma

Nomenclature of the Course:

Course Code:

Name of the Internal Examiner:

Name of the External Examiner:

SR. No.	Roll. No.	Written work and /or Conduct of Experiment(s) (20)	(VIVA-VOCE) (20)			Laboratory Record/File (10)	Total Marks (50)
1							
2							
3							
.							
Total No. of Students:				Present:		Absent:	
Name and signature of the Internal Examiner				Name and signature of the External Examiner			

Chapter 6: Evaluating Training and Project Reports

Evaluation of Industrial Training/Internship

It is mandatory for all the students to go for industrial training or internship after fourth semester and sixth semester. The students' internship work is evaluated as per the criteria given in the evaluation proforma given below.

Department of Computer Science and Engineering Gurugram University, Gurugram-122018							
Name of the Programme: _____						Credits:	
Semester: _____						Total Marks: 100	
Session: _____							
Evaluation of Industrial Training (INT-CSE301)							
SR. No.	Roll. No.	Significance and originality of the problem addressed and the solution provided	Knowledge of the problem domain and the tool used (VIVA-VOCE)	Judgement of the skill learnt and system developed	Quality of Report Writing	Level of ethics followed	Total
		CO1+CO2 (20)	CO3 (25)	CO4 (20)	CO5 (20)	CO6 (15)	100
1							
2							
3							
.							
.							
Name (s) and Signature of the Internal/External Examiner(s): Date: Name and Signature of the Chairperson				Total Candidates: No. of Candidates Present: No. of Candidates Absent:			

Guidelines for Preparing Industrial Training (Code) Report

All the students are required to follow these guidelines for preparing their industrial training report.

General Guidelines

1. The industrial training report must include a declaration by the student that he/she has followed ethical practices while doing the industrial training work. Any violation of ethical practices will lead to rejection of the industrial training report. For instance, a plagiarized report or a readymade report purchased from market will be rejected straight away.
2. Industrial training work carried out in groups of two students must include the individual contribution of the students.
3. The industrial training report must be submitted to the internal guide in soft binding at least 7 days before the final submission so that he/she can suggest changes.

Formatting Instructions

The formatting instructions are given in Table below.

Formatting Instructions		
Sr. No.	Item	Formatting
1.	No. of pages	Minimum 20 and maximum 40
2.	Paper size	A4
3.	Font Type	Times New Roman
4.	Normal text size	12
5.	Page numbering	Place: Centre Bottom Type: Front material in Roman numbers
6.	Margins	Left margin: 3.75 cms (1.5 inch) Right, bottom, top= 2.5 cms (1 inch)
7.	References/Bibliography	IEEE format
8.	Binding	soft binding of good quality

Contents of the Industrial Training Report

The contents of the industrial training report should be organised as described below.

1. Declaration that the students has carried out his work on his own. It is his/her original creation, not plagiarised from any other source and due credit has been given to the source material used in the industrial training report through references and citations.
2. Acknowledgement
3. List of figures
4. List of Tables
5. List of Abbreviations
6. Contents

Contents in the Body of the industrial training report

The report must be written in English. The ideas must be organised in a clear and concise fashion.

S. No	Content	Tentative No. of pages
1.	Profile of the Company	At most 2 pages
2.	Introduction	4-5 pages
3.	Description of skills learned	6-10 pages
4.	Application developed (if any) based on skills learnt	20-40 pages
5.	Scope of the training/ Application developed	2 paragraph

The industrial training report should not no way exceed 70 pages and should be submitted in soft binding of good quality as per university norms.

Format of the title page

The format of the title page is given is given on next page.

TITLE OF THE INDUSTRIAL TRAINING REPORT

(Write in Times New Roman, 16-point size, Bold and Centred and Uppercase font)

Training report submitted to

Gurugram University, Gurugram for the partial award of the degree

(Write in Times New Roman, 12-point size font, Bold, Italics and Centred style after 4 lines gap with 12 font size from the title of the project)

of

(Write in Times New Roman, 12-point size font, Bold, Italics and Centred style after 1 lines gap with 12 font size from the text above in three lines)

**Bachelor of Technology
in Computer Science and Engineering
(Cyber Security)**

(Write in Times New Roman, 14-point size, Bold, Centred style after “*of*” after 1 line gap with 12 font size)

By

(Write in Times New Roman 12-point size, Bold, Italics, and Centred style after the name of the degree with 1 line gap with 12 font size)

Your Name

(Enrolment Number)

(Write in Times New Roman, 14-point size font, Bold, Centred style after 1 line gap with 12 font from “*By*”)



**Department of Computer Science & Engineering
GURUGRAM UNIVERSITY, GURUGRAM**

Month, Year

(Write in Times New Roman, 14-point size font, Bold, Centred style, after 2 lines gap from logo)

Declaration to be submitted for training report

DECLARATION

I, *Your Name, Your Roll No.*, certify that the work contained in this industrial training report is original and has been carried by me in the ----- company name. This work has not been submitted to any other institute for the award of any degree and I have followed the ethical practices and other guidelines provided by the Department of Computer Science and Engineering in preparing the industrial training report.

Signature

Name of Student
Registration Number
Department of Computer Science and Engineering

Gurugram University, Gurugram

Signature
Supervisor/Mentor
Designation
Department of Computer Science and Engineering

Gurugram University, Gurugram

Evaluation of mini-project

The proforma for evaluating the project using open source tools is given on the next page.



Gurugram University Gurugram

Department of Computer Science and Engineering
Gurugram University, Gurugram-
122018

Name of the Programme:

Credits:

Total Marks: 100

Semester

Session:

Evaluation of Industrial Training/Internship Report (Code)

SR. No.	Roll. No.	Significance of the problem addressed CO1 (15)	Knowledge of the problem domain CO2 (15)	Knowledge of the techniques and tools used CO3 (15)	Quality of the solution provided CO4 (20)	Quality of the Report Writing CO5 (20)	Level of engagement with ethical practices and self-learning CO6 (15)	Total (100)
1								
2								
3								
.								
.								

Name of the examiner(s):

Total Candidates:

Signature of the Examiner(s):

No. of Candidates Present:

Date:

No. of Candidates Absent:

Signature of Chairperson



Gurugram University Gurugram