Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY
Udumalai Road, Pollachi, Coimbatore District - 642003
Established in 1998 ♦ Approved by AICTE ♦ Affiliated to Anna University
(A DIVISION OF NIA EDUCATIONAL INSTITUTIONS)
NAAC A++ GRADE
Cycle 3 (2023-2030)
The Highest Grade

Curriculum and Syllabi

B.E Computer Science and Engineering (Cyber Security)

Semesters I to VI

Regulations 2023

Dr. Mahalingam College of Engineering and Technology, Pollachi 642003.

(An autonomous institution approved by AICTE andaffiliated to Anna University)

Department of Computer Science and Engineering (Cyber Security)

Vision

- To develop competent professionals specialized in cyber security with global employability, entrepreneurship capability, research focus and social responsibility

Mission

- To develop proficient cyber security engineers by providing state of art academic environment and industry driven curriculum
- Encourage students to become entrepreneurs and to take higher studies in the field of cyber security.
- To enrich the department through dedicated and technically sound faculty team with research focus in thrust areas cyber security
- To provide technical solutions for cyber security problems and threats through technical innovations and projects in association with the industry, society and professional bodies.

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Programme: **B.E. Computer Science and Engineering (Cyber Security)**

Programme Educational Objectives (PEOs) - Regulation 2023

B.E Computer Science and Engineering (Cyber Security) graduates will:

PEO 1. Technical Skills: The graduate will have strong technical and foundation in the field of computer science specialized in cyber security.

PEO 2. Security Experts: The graduates have the ability to address and provide feasible and viable solutions to security needs of modern computing industry

PEO 3. Social awareness and ethics: The graduates will possess good ethical attitude, strong communication skills and greater awareness in social moral responsibilities.

Programme Outcomes (POs) - Regulations 2023

On successful completion of B.E. Computer Science and Engineering (Cyber Security) programme, graduating students/graduates will be able to:

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 modelling 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.

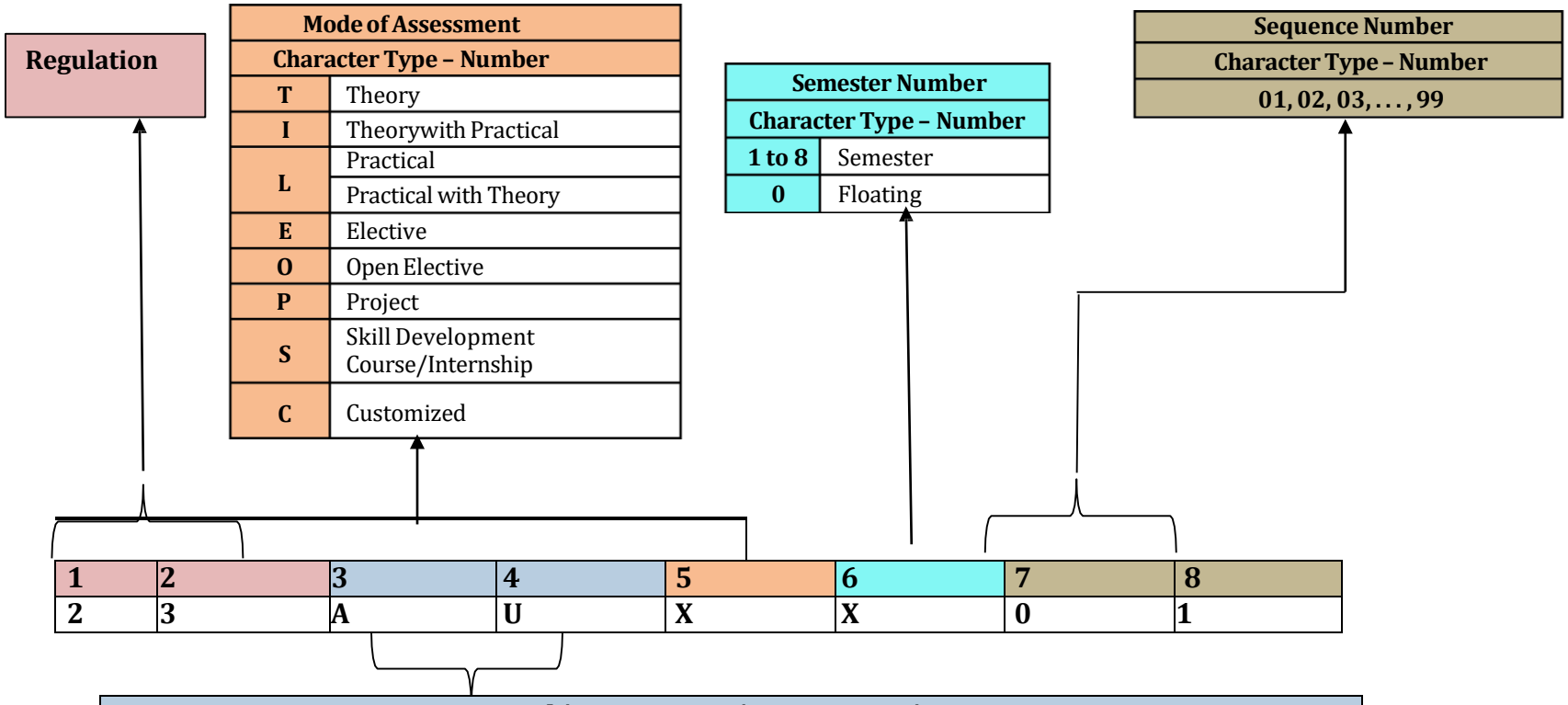
Programme Specific Outcomes (PSOs) - Regulations 2023

PSO 1. Security engineering: Ability to design and develop viable solution and systems to cater real world cyber security problems and issues in the field of computer based industries.

PSO 2. **Knowledge engineering:** Ability to develop new products and services and perform research in the field of cyber security.

Dr. Mahalingam College of Technology, Pollachi

2023 Regulations - Course Code Generation Procedure for UG Courses



Board/Department/Programme/Course Type			
Character Type – Alphabet			
AD	Artificial Intelligence & Data Science	**ME**	Mechanical
AM	CSE (Artificial Intelligence & Machine Learning)	**SC**	CSE (Cyber Security)
AU	Automobile	**PH**	Physics
CE	Civil	**CH**	Chemistry
CS	Computer Science	**EN**	English
EA	Advanced Communication Technology	**MA**	Mathematics
EC	Electronics and Communication	**ES**	Employability Skills
EE	Electrical and Electronics	**VA**	Value Added Course
EV	VLSI Design & Technology	**SA**	Studio Activities
IT	Information Technology		

Programme: B.E Computer Science and Engineering (Cyber Security)
2023 Regulations (For 2023 Batch Only)
Curriculum for Semester I & II

Course Category	Course Code	Course Title	Duration	Credits	Marks
VAC	23VAL101	Induction Program	3 Weeks	-	100

Semester I

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI101	Communication Skills I	2	0	2	3	100	All
Minor	23MAI103	Linear Algebra and Infinite Series	3	0	2	4	100	AD, AM, CS, IT, SC
Minor	23PHT001	Physics for Information Sciences	3	0	0	3	100	AD, AM, CS, IT, SC
Major	23CST101	Problem Solving using C	3	0	0	3	100	AD, AM, CS, IT, SC
Multi - disciplinary	23EEI101	Basics of Electrical and Electronics Engineering	3	0	2	4	100	AD, AM, CS, IT, SC
Minor	23PHL001	Physics for Information Sciences Laboratory	0	0	3	1.5	100	AD, AM, CS, IT, SC
SEC	23CSL101	Problem Solving using C Laboratory	0	0	3	1.5	100	AD, AM, CS, IT, SC
VAC	23VAL102	Wellness for Students	0	0	2	1	100	All
VAC	23VAT101	தமிழர்மரபு /Heritage of Tamils	1	0	0	1	100	All
AEC	23SAL101	Studio Activities	0	0	2	-	-	All
		Total	**15**	**0**	**16**	**22**	**900**	

Semester II

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI201	Communication Skills II	2	0	2	3	100	All
	23FLT201	Foreign Language - Japanese	3	0	0			
	23FLT202	Foreign Language - German	3	0	0			
Minor	23MAI203	Calculus and Transforms	3	0	2	4	100	AD, AM, CS, IT, SC
Major	23ITT201	Data Structures	3	0	0	3	100	AD, AM, CS, IT, SC
Multi - disciplinary	23EEI201	Digital System Design	2	0	2	3	100	AD, AM, CS, IT, SC
Multi – disciplinary	23MEL001	Engineering Drawing	1	0	3	2.5	100	AD,AM,CS,EA, EC,EE,EV,IT,SC
SEC	23ITL201	Data Structures Laboratory	0	0	3	1.5	100	AD, AM, CS, IT, SC
SEC	23CSL201	IT Practices Laboratory	0	0	4	2	100	AD, AM, CS, IT, SC
SEC	23ESL201	Professional Skills 1: Problem solving skills & Logical Thinking 1	0	0	2	1	100	All
VAC	23VAT201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	1	0	0	1	100	All
Multi - disciplinary	23CHT202	Environmental Sciences	1	0	0	-	100	All
AEC	23SAL201	Studio Activities	0	0	2	-	-	All
		Total	**13**	**0**	**20**	**21**	**1000**	

Programme: B.E Computer Science and Engineering (Cyber Security)
2023 Regulations (From 2024 Batch Onwards)
Curriculum for Semester I to IV

Course Category	Course Code	Course Title	Duration	Credits	Marks
VAC	23VAL101	Induction Program	3 Weeks	-	100

Semester I

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI101	Communication Skills I	2	0	2	3	100	All
Minor	23MAI103	Linear Algebra and Infinite Series	3	0	2	4	100	AD, AM, CS, IT, SC
Minor	23PHT001	Physics for Information Sciences	3	0	0	3	100	AD, AM, CS, IT, SC
Major	23CST101	Problem Solving using C	3	0	0	3	100	AD, AM, CS, IT, SC
Multi – disciplinary	23EEI102	Introduction to Electrical and Electronics Engineering	3	0	2	4	100	AD, AM, CS, IT, SC
Minor	23PHL001	Physics for Information Sciences Laboratory	0	0	3	1.5	100	AD, AM, CS, IT, SC
SEC	23CSL101	Problem Solving using C Laboratory	0	0	3	1.5	100	AD, AM, CS, IT, SC
VAC	23VAL102	Wellness for Students	0	0	2	1	100	All
VAC	23VAT101	தமிழர் மரபு / Heritage of Tamils	1	0	0	1	100	All
AEC	23SAL101	Studio Activities	0	0	2	-	-	All
		Total	**15**	**0**	**16**	**22**	**900**	

Semester II

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI201	Communication Skills II	2	0	2	3	100	All
	23FLT201	Foreign Language - Japanese	3	0	0			
	23FLT202	Foreign Language - German	3	0	0			
Minor	23MAI203	Calculus and Transforms	3	0	2	4	100	AD, AM, CS, IT, SC
Major	23ITT201	Data Structures	3	0	0	3	100	AD, AM, CS, IT, SC
Multi - disciplinary	23EEI201	Digital System Design	2	0	2	3	100	AD, AM, CS, IT, SC
Multi – disciplinary	23MEL001	Engineering Drawing	1	0	3	2.5	100	AD, AM, CS, EA, EC, EE, EV, IT, SC
SEC	23ITL201	Data Structures Laboratory	0	0	3	1.5	100	AD, AM, CS, IT,SC
SEC	23CSL201	IT Practices Laboratory	0	0	4	2	100	AD, AM, CS, IT, SC
SEC	23ESL201	Professional Skills 1: Problem solving skills & Logical Thinking 1	0	0	2	1	100	All
VAC	23VAT201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	1	0	0	1	100	All
Multi - disciplinary	23CHT202	Environmental Sciences	1	0	0	-	100	All
AEC	23SAL201	Studio Activities	0	0	2	-	-	All
Total			**13**	**0**	**20**	**21**	1000	

Semester III

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAT305	Discrete Mathematics	3	1	0	4	100	AM, CS, IT, SC
Major	23SCI301	Object Oriented Programming	3	0	2	4	100	AM&SC
Major	23SCT301	Computer Organization and Architecture	3	0	0	3	100	AM&SC
Major	23SCT302	Principles of Communication and Cyber Attacks	3	0	0	3	100	-
Major	23SCI302	Database Design	3	0	2	4	100	AM&SC
Major	23SCL301	Programming Using Python Laboratory	0	0	3	2	100	AM&SC
SEC	23ESL301	Professional Skills 2: Problem solving skills & Logical Thinking 2	0	0	2	1	100	All
VAC	23VAT301	Universal Human Values 2: Understanding Harmony	2	1	0	3	100	All
AEC	23SAL301	Studio Activities	0	0	2	-	-	All
		Total	**17**	**2**	**11**	**24**	**800**	

Semester IV

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAT401	Probability and Statistics	3	1	0	4	100	All
Major	23SCI401	Basics of Operating Systems	3	0	2	4	100	AM& SC
Major	23SCT401	Computer Networks and Attacks	3	0	0	3	100	-
Major	23SCT402	Cryptography and Security	3	0	0	3	100	-
Major	23SCL401	Computer Networks and Cyber Laboratory	0	0	4	2	100	-
Major	23SCL402	Cryptography and Security Laboratory	0	0	4	2	100	-
SEC	23ESL401	Professional Skills 3: Professional Development and Etiquette	0	0	2	1	100	-
AEC	23SAL401	Studio Activities	0	0	2	-	-	All
		Total	**12**	**1**	**14**	**19**	**700**	

Course Category	Course Code	Course Title	Duration	Credits	Marks
SEC	23XXXXXX	Internship – 1 / Community Internship / Skill Development	2Weeks – 4Weeks	1	100

Semester V

Course Category	Course Code	Course Title	Hours / Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23SCT501	Applied Cryptography	3	0	0	3	100	-
Major	23SCT502	System Security	3	0	0	3	100	-
Major	23SCT503	Distributed Computing	3	0	0	3	100	-
Major	23SCT402	Applied Cryptography Laboratory	0	0	3	1.5	100	-
Major	23SCL401	System Security Laboratory	0	0	3	1.5	100	-
Major	23XXXXXX	Professional Elective – I	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective – II	3	0	0	1	100	-
SEC	23ESL501	Professional Skills 4: Communication Skills and Interview Essentials	0	0	2	1	100	
Project	23SCP501	Reverse Engineering Project	0	0	6	3	100	
AEC	23SAL501	Studio Activities	0	0	2	-	-	All
		Total	**12**	**1**	**14**	**19**	**700**	

Semester VI

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23SCT601	Cyber Forensics	3	0	0	3	100	-
Major	23SCT602	Network Security	3	0	0	3	100	-
Major	23SCL601	Advanced Protocol Engineering and Security Laboratory	0	0	3	1.5	100	-
Major	23SCL602	Network Security Laboratory	0	0	3	1.5	100	
Major	23XXXXXX	Professional Elective – III	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective – IV	3	0	0	3	100	-
Minor	23XXXXXX	Open Elective-I	3	0	0	3	100	-
SEC	23ESL601	Professional Skills 5: Ace and Elevate : Aptitude and Soft Skills	0	0	2	1	100	All
AEC	23SAL601	Studio Activities	0	0	2	-	-	All
		Total	**15**	**0**	**10**	**19**	**800**	

Course Category	Course Code	Course Title	Duration	Credits	Marks
SEC	23XXXXXX	Internship – 2/ Research Internship / Skill Development	2 Weeks – 4 Weeks	1	100

Semester VII

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23SCT701	Web AppSec: Principles and Practices	3	0	0	3	100	-
Major	23SCT702	Cloud Computing and Security	3	0	0	3	100	-
Major	23SCL701	Web Application Security Laboratory	0	0	3	1.5	100	-
Major	23SCL702	Cloud Computing and Security Laboratory	0	0	3	1.5	100	-
Major	23XXXXXX	Professional Elective– V	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective – VI	3	0	0	3	100	-
Minor	23XXXXXX	Open Elective – II	3	0	0	3	100	-
Project	23XXXXXX	Project Phase - I	0	0	6	4	100	-
		Total	**15**	**0**	**12**	**22**	800	

Semester VIII

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Project	23XXXXX	Project Phase - II	0	0	12	6	200	-
SEC	23XXXXX	Internship - 3 / Skill Development	8 Weeks			4	100	-
		Total	**0**	**0**	**12**	**10**	**300**	

Total Credits: 164

Vertical Wise Electives

Vertical I Full stack Development							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
23SCE001	Enterprise Application Development	3	0	0	3	100	-
23SCE002	Web Interface Design	3	0	0	3	100	-
23SCE003	Software Testing and Test Automation	3	0	0	3	100	-
23SCE004	Foundations of Programming languages	2	0	2	3	100	-
23SCE005	DevOps and Deployment	2	0	2	3	100	-
23SCE006	Compiler Theory and Design	3	0	0	3	100	-

Vertical II Machine Learning							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
23SCE007	Image Data Analytics	3	0	0	3	100	-
23SCE008	Machine Learning Techniques for Cyber Security	2	0	2	3	100	-
23SCE009	Optimization Techniques	2	0	2	3	100	-
23SCE010	Principles of Artificial Intelligence	3	0	0	3	100	-
23SCE011	Soft Computing Concepts	3	0	0	3	100	-
23SCE012	Neural Networks and Deep Learning techniques	3	0	0	3	100	-

Vertical III Cloud Computing and Data Center Technologies							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
23SCE013	Edge Computing: Concepts and Applications	3	0	0	3	100	-
23SCE014	Cloud Services Management	3	0	0	3	100	-
23SCE015	Modern Storage Technologies	3	0	0	3	100	-
23SCE016	Software Defined Networks	3	0	0	3	100	-
23SCE017	Cloud Security and Privacy	3	0	0	3	100	-
23SCE018	Stream Processing	3	0	0	3	100	-

Vertical IV Cyber Security and Data Privacy							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
23SCE019	Secure coding	3	0	0	3	100	-
23SCE020	Malware and Reverse Engineering	3	0	0	3	100	-
23SCE021	Cyber Security in Social Network Platforms	3	0	0	3	100	-
23SCE022	Wireless Sensor Network Security	3	0	0	3	100	-
23SCE023	Digital and Mobile Forensics	3	0	0	3	100	-
23SCE024	Crypto currency and Block Chain Technologies	3	0	0	3	100	-
23SCE025	Foundations of Ethical Hacking	2	0	2	3	100	-
23SCE026	Vulnerability Assessment and Penetration Testing	2	0	2	3	100	-
23SCE050	Cyber Security	3	0	0	3	100	AM,AD,AU,EC,EV ,EE,ME & SC

Vertical V Emerging Technologies							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
23SCE027	Immersive Technologies	2	0	2	3	100	-
23SCE028	Introduction to Robotic Process Automation	3	0	0	3	100	-
23SCE029	Principles of Quantum Computation	3	0	0	3	100	-
23SCE030	Real Time Cyber Security	3	0	0	3	100	-
23SCE031	Principles of Game Design and Development	2	0	2	3	100	-
23SCE032	Embedded system and IoT	3	0	0	3	100	-

Open Electives (Offered to other Programmes)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
23SCO001	Cyber Laws	3	0	0	3	100	-
23SCO002	Digital Watermarking and Steganography	3	0	0	3	100	-
23SCO003	Criminal Psychology and Behavior Intelligence	3	0	0	3	100	-
23SCO004	Biometric and Security	3	0	0	3	100	-
23SCO005	Security Audit and Risk Assessment	3	0	0	3	100	-

Diversified Electives

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
23AUE050	Entrepreneurship Development	3	0	0	3	100	-
23AUE051	Design Thinking and Innovation	3	0	0	3	100	-
23ITE043	Integrated Big Data Solutions	3	0	0	3	100	-
23ITE044	AWS Services with Devops Tools	2	0	2	3	100	-
23ITE047	Intellectual Property Rights	3	0	0	3	100	-
23MEE008	PLM for Engineers	2	0	2	3	100	-

SEMESTER I

Course Code:23VAL101		Course Title: Induction Program (Common to all B.E/B.Tech Programmes)
Course Category: VAC		Course Level: Introductory
Duration: 3 weeks	Mandatory Non- Credit Course	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Explain various sources available to meet the needs of self, such as personal items and learning resources.
2. Explain various career opportunities, opportunity for growth of self and avenues available in the campus.
3. Explain the opportunity available for professional development.
4. Build universal human values and bonding amongst all the inmates of the campus and the society.

List of Activities:

1. History of Institution and Management: Overview on NIA Educational Institutions – Growth of MCET – Examination Process –OBE Practices –Code of Conduct – Centre of Excellence.
2. Lectures, interaction sessions and Motivational Talks by Eminent people, Alumni, Employer and Industry Experts
3. Familiarization of Department / Branch: HoD's & Senior Interaction- Department Association
4. Universal Human Value Modules: Aspirations and concerns, Self-Management, Relations, Social and Natural Environment.
5. Orientation on Professional Skills Courses
6. Proficiency Modules : Mathematics, English, Physics and Chemistry
7. Introduction to various Chapters, Cells, Clubs and its events
8. Creative Arts : Painting, Music and Dance
9. Physical Activity :Games, Sports and Yoga
10. Group Visits: Visit to local area and Campus Tour

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1 : Explain various sources available to meet the needs of self, such as personal items and learning resources through visit tolocal areas and campus	Understand
CO2: Explain various career opportunities and avenues available in the campus through orientation sessions	Understand
CO3: Explain the opportunity available for professional development through professional skills, curricular, co-curricular and extracurricular activities	Understand
CO4: Build universal human values and bonding amongst all the inmates of the campus and society for having a better life	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	2	-	-	-	-	-	-	2	1	2	-	-	-	-

High : 3, Medium :2, Low: 1

Text Book(s):

T1. Reading material, Workbook prepared by PS team of the college

Reference Book(s):

R1. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster Uk, 2004.

R2. Vethathiri Maharishi Institute For Spiritual and Intuitional Education, aliyar, “value educatharmonious life (Manavalakalai Yoga)”, Vethathri Publications, Erode, 2010.

R3. Dr.R.Nagarathna, Dr.H.R. Nagendra, “ Integrated approach of yoga therapy for positiveSwami Vivekananada Yoga Prakashana Bangalore,2008 Ed.

Web References:

1. https://youtube.com/playlist?list=PLYwzG2fd7hzc4HerTNkc3pS_IvcCfKznV
2. https://www.youtube.com/watch?v=P4vjfEVk&list=PLWDeKF97v9SO0frdgmpaghDMjkom1
3. https://fdp-si.aicte-india.org/download/AboutSIP/About%20SIP.pdf

Course Code: 23ENI101	Course Title: Communication Skills (Common to all B.E/B.Tech Programmes)		
Course Category: AEC		Course Level: Introductory	
L:T:P(Hours/Week) 2:0:2	Credits: 3	Total Contact Hours:60	Max Marks:100

Course Objectives

The course is intended to impart formal and informal language effectively and accurately in various real-life contexts on par with B1 level of CEFR Scale.

Module I **20 Hours**

Grammar: Synonyms & Antonyms -Tense forms - Modals - Passives – Reported Speech – Comparatives and Descriptive adjectives.

Listening: Listening for gist and specific information - Listening to past events, experiences and job preferences - Listening to descriptions of monuments- Listening for excuses - Listening to description: transportation systems and public places.

Speaking: Introducing oneself - Exchanging personal information – Effective Conversations: Role Play Situations (Describing personality traits - Describing landmarks, monuments and festivals - Making polite requests and excuses - Discussing facts - Asking for and giving information – Expressing wishes - Talking about lifestyle changes - Talking about transportation and its problems - Describing positive and negative features of things and places - Making comparisons)

Reading: Skimming and Scanning - Reading Comprehension - Reading and comprehending online posts and emails – Case Studies

Writing: Letter writing (Permission letters - Online cover letter for job applications) - Instructions - Recommendations - Write a blog (General) - Report Writing (Industrial Visit Report and Event Reports) - formal and informal emails.

Module II **20 Hours**

Grammar: Sequence adverbs - Phrasal verbs - Relative clauses – Imperatives - Infinitives - Conditionals.

Listening: Listening to review of food items - Listening to results of surveys- Listening to motivational talks & podcasts

Speaking: Expressing likes and dislikes - Describing a favourite snack - Giving advices and suggestions - Speculating about past and future Events – Group Discussion

Reading: Reading different expository texts - Reading to factual texts - Print and online media- Reading Comprehension.

Writing: Process Descriptions – Email Writing (Requesting for information) - Reviewing Movie – Social media feeds/posts (Any Social Media)

List of Experiments: **20 Hours**

1. Mini Presentation and Picture Prompt Discussion
2. Debate Tournament
3. Listening, Mind Mapping & Summarization
4. Listening to Stories and Providing the Innovative Climax
5. Reading Comprehension
6. Writing - Interpretation of Visuals

Course Outcomes	**CognitiveLevel**
At the end of this course, students will be able to:	
CO1: Utilize the basic English grammar and vocabulary to acquire professional communication skills.	Apply
CO2: Develop listening and speaking skills through classroom activities based on listening comprehension, recapitulation, interpretation and debate on the same	Apply
CO3: Read and write social media posts and comments	Apply
CO4: Perform as a member of a team and engage in individual presentation	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	-	-	-

High-3; Medium-2;Low-1

Textbook(s):

T1. Jack C. Richards, Jonathan Hull, and Susan Proctor, “Interchange - Student’s book 2”, 5thEdition, Cambridge University Press, South Asia Edition, 2022.

T2. Jack C. Richards, Jonathan Hull, and Susan Proctor, “Interchange - Student’s Book 1”, 5thEdition, Cambridge University Press, South Asia Edition, 2022.

Reference Book(s):

R1. David Bohlke, Jack C. Richards, “Four Corners”, 2nd Edition, Cambridge University Press,2018.

R2. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, Graham Burton,Empower B1 – Student’s Book, Cambridge University Press, 2020.

R3. Raymond Murphy, “Intermediate English Grammar” 30th Edition, Cambridge University Press,2022.

Web References:

1. https://speakandimprove.com/
2. https://writeandimprove.com/
3. https://www.cambridgeenglish.org/exams-and-tests/linguaskill/

Course Code: 23MAI103		Course Title: Linear Algebra and Infinite Series (Common to AD, AM, CS, IT & SC)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week)3:0:2	Credits: 4	Total Contact Hours: 75	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on Linear Algebra, vector spaces, sequences and series in mathematics to have a strong foundation in science and engineering.

Module I **23 Hours**

Solutions to System of Linear Algebraic Equations: Matrices- Rank of a matrix - Consistency of a system of linear equations- Row echelon form-Row reduced echelon form-Gauss elimination method- Crout's method.

Basis and Dimension of Vector Spaces: Vector spaces -Linear Independent and dependent of vectors-Basis, dimension, row space, column space, null space, rank nullity theorem.

Orthogonality and Inner Product Space: Inner product of vectors-Inner product spaces-length of a vector, distance between two vectors, orthogonality of vectors-orthogonal projection of a vector-Gram-Schmidt process- orthonormal basis.

Module II **22 Hours**

Eigen Values and Eigen Vectors: Eigen values and vectors-symmetric, skew symmetric and orthogonal matrices- Diagonalization of matrix through orthogonal transformation- Reduction of quadratic forms to canonical form-rank ,index, signature and nature of quadratic forms-Singular Value decomposition.

Sequences and Series: Sequences-definitions and examples- Series-Tests for convergence-comparison test, integral test, Cauchy's root test, Alembert's ratio test-Alternating series -Leibnitz's test.

List of Experiments: **30 Hours**

1. Introduction to MATLAB
2. Row Echelon form and Row reduced Echelon form of a matrix.
3. Rank of a matrix and solution of a system of linear equations
4. Dimension of row space, column space and null space.
5. Gram-Schmidt Orthogonalization.
6. Eigenvalues and Eigenvectors of matrices.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply matrix techniques for solving system of linear equations and Apply the process of orthogonalization to find orthogonal vectors.	Apply
CO2: Determine the canonical form of a quadratic form using orthogonal transformation in Science and Engineering problem solving.	Apply
CO3: Apply different tests to find convergence and divergence of series in the problem solving.	Apply
CO4: Demonstrate the understanding of linear algebra concepts through modern tool.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & sons, 2010.

T2. David C Lay, Linear Algebra and its Applications, 3rd edition, Pearson India, 2011.

T3. Howard Anton, Chris Rorres, Elementary Linear Algebra Applications version,11th edition, Wiley India edition, 2013.

Reference Book(s):

R1. T. Veerarajan, Engineering Mathematics for first year, 3rd edition, Tata McGraw-Hill, 2019.

R2. V. Krsihnamurthy, V. P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.

R3. P. Sivaramakrishna Das , C. Vijayakumari , Engineering Mathematics, Pearson India, 2017.

Web References:

1. https://nptel.ac.in/courses/111106051
2. https://www.classcentral.com/course/matrix-algebra-engineers-11986

Course Code: 23PHT001		Course Title: Physics for Information Sciences (Common to AD, AM, CS, IT & SC)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week)3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives:

The course is intended to impart the knowledge on working mechanism of laser, fiber optics, display devices and introduce the concepts of integrated circuits, nanotechnology and quantum computing

Module I **22 Hours**

Laser: Characteristics of laser light- Einstein's theory of matter and radiation – A & B Coefficients- Stimulated and spontaneous emission of radiation - Population inversion and pumping methods – Types of laser: Nd: YAG laser and Carbon di oxide (CO_2) molecular gas laser - Semiconductor laser (Homo junction and hetero junction) – Applications: Hologram and Holographic data storage (record/read).

Fiber Optics: Optical fibers – Principle of light propagation through optical fibers - Expressions for numerical aperture and acceptance angle - Types of optical fibers based on material, refractive index, and mode of propagation- Fabrication of optical fiber: Double crucible method- Dispersion and attenuation in optical fiber - Photo detectors: PN, PIN & Avalanche photo diodes- Fiber optic communication system and its advantages.

Nano Technology: Introduction – Importance of Nanotechnology – Nanomaterials – Nanoparticles – Synthesis of Nanoparticles: High- energy ball milling (top-down approach) – Sol-gel process (bottom-up approach) –Application of Nanomaterials.

Module II **23 Hours**

Quantum Computing: Introduction to Quantum Computing - Uses and Benefits of Quantum Computing - Features of Quantum Computing : Superposition, Entanglement, Decoherence - Limitations of Quantum Computing – Comparison of Quantum Computer with Classical Computer - Quantum Computers In Development : Google, IBM, Microsoft and others.

Integrated Circuits: Introduction to semiconductors: Intrinsic and extrinsic Semiconductors- Advantages of Integrated circuits (ICs) over discrete components- IC classification- Construction of bipolar transistor: Silicon Wafer Preparation - Epitaxial growth - Oxidation- Photolithography- Isolation diffusion - Base diffusion - Emitter diffusion - Contact mask- Aluminium metallization – Passivation- Structures of integrated PNP transistor.

Display Devices: Human vision - Red, Blue, and Green (RGB) color scheme – Primary and secondary colors- Color addition and subtraction-Optical Emissions: Luminescence, photoluminescence, cathodoluminescence- electroluminescence -Injection electro Luminescence- Displays (Working principles): Plasma display, LED display, Liquid crystal display (LCD) and Numeric display.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply the basic concepts of laser, fiber optics and nanotechnology to solve different optical parameters.	Apply
CO2: Perform as a member of team in analysing the concepts of laser, fiber optics and nanotechnology involved in engineering applications related to science and technology and make a presentation.	Apply
CO3: Interpret the concepts of nanomaterials, IC fabrication techniques and display devices and apply it for different real-life applications.	Apply
CO4: Perform as a member of team in articulating the modern technologies behind nanotechnology, integrated circuits and display devices.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	1	3	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	1	3	-	-	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. M. N. Avadhanulu and P. G. Kshirsagar, “Text Book of Engineering Physics”, S. Chand & Company Ltd., New Delhi, 2018.

T2. David Armitage, “Introduction to Micro displays”, John Wiley & Ltd, 2006.

T3. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd, 3rd Edition, 2010

Reference Book(s):

R1. D. Halliday., R. Resnick and J. Walker, “Fundamentals of Physics”, Wiley Publications, 10th Edition, 2014.

R2. Ajoy Ghatak, “Optics”, Tata McGraw-Hill Education, New Delhi, 5th Edition, 2012.

R3. A. Marikani, “Engineering Physics”, PHI Learning, New Delhi, 2nd Edition, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ph32/preview
2. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
3. https://www.investopedia.com/terms/q/quantum-computing.asp

Course Code: 23CST101		Course Title: Problem Solving using C (Common to AD, AM, CS, IT&SC)	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week)3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives: The course is intended to impart knowledge on basic concepts of C.

Module I **23 Hours**

C Programming Basics: General Problem solving strategy – Program development cycle - Problem Solving Techniques : Algorithm, Pseudocode and Flow Chart - Overview of C – Structure of C program – C Character set – keywords - Identifiers – Variables and Constants – Data types – typedef- Type conversion – Operators and Expressions – Managing formatted and unformatted Input & Output operation.

Control Structures: Storage classes - Statements: Selection statements - Jump statements - Iteration statements.

Arrays: Characteristics of Array – Single-dimensional array – Two-dimensional array – Array Operations – Applications: Linear search, Selection sort, Matrix Operations.

Functions: Declaration & Definition – Return statement – Classification of functions – Parameter passing methods: call by value – call by reference – Passing Array to a Function– Returning Array from a function – Recursion.

Module II **22 Hours**

Strings: Declaration and Initialization of string – Display of strings with different formats – String library Functions – String conversion functions.

Pointers: Features - Types of Pointers: Null and Void pointer – Operations on pointers – Pointers to an Array.

Structures: Declaration & Initialization of Structures – Structure within Structure – Array of Structures – Pointer to Structures.

Union: Declaration & Initialization of Union – Enumerations.

Files: Introduction to Files – Streams and File Types – File operations (Open, close, read, write) – Command line arguments.

Preprocessor Directives: Macro Expansion, File Inclusion, Conditional Compilation.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand the fundamental concepts of programming, such as variables, data types, control structures, and functions.	Understand
CO2: Design and develop C programs for real-world applications	Apply
CO3: Apply problem-solving skills and knowledge of c programming constructs to solve a given problem	Apply
CO4: Analyze and debug C programs to identify and fix errors.	Analyze
CO5: Apply modular programming techniques to break down complex programs into smaller, manageable modules	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3		-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	-	-	-	-	-	-	-	-	-	2	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Yashavant P.Kanetkar, "Let Us C", 19th Edition, BPB Publications, 2022.

T2. Ashok N.Kamthane, Amit.N.Kamthane, "Programming in C", 3rd Edition, Pearson Education, 2015.

Reference Book(s):

R1. Ajay Mittal, "Programming in C - A Practical Approach", 3rd Edition, Pearson Education, 2010.

R2. Brian W.Kernighan and Dennis M.Ritchie,"The C Programming Language" 2nd Edition, Pearson Education, 2015.

R3. Venit S, and Drake E, "Prelude to Programming Concepts and Design", 6th Edition, Pearson Education, 2014

R4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", 2nd Edition, Oxford University Press, 2013.

Web References:

1. http://www.cprogramming.com/

2. http://www.c4learn.com/

Course Code: 23EEI101	Course Title: Basics of Electrical and Electronics Engineering (Common to AD, AM, CS, IT and SC) (2023 Batch only)		
Course Category: Multidisciplinary	Course Level: Introductory		
L:T:P(Hours/Week)3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on engineering fundamentals of DC&AC circuits, Electrical machines, Electron devices, Carpentry and plumbing.

Module I **22 Hours**

Fundamentals of DC Circuits: Definition, symbol and unit of quantities – Active and Passive elements – Ohm's Law: statement, – Kirchhoff's Laws: statement and illustration – Resistance in series and voltage division rule – Resistance in parallel and current division rule – Star to Delta and Delta to Star transformation- circuit simplification.

AC Fundamentals: Magnetic Circuits: Definition of magnetic quantities – Law of electromagnetic induction – Generation of single phase alternating EMF – Terminology – 3 Phase System: 3-Wire and 4 Wire system – Root Mean Square (RMS) – Average value of AC

DC Machines: DC Generator and DC Motor: Construction, Working Principle.

Module II **23 Hours**

AC Machines: Single phase transformer: Construction, working principle - Single phase induction motor: Capacitor start and run -Three phase induction motor: An introduction.

Semiconductor Devices: Theory of Semiconductor: PN junction diode, Forward Bias Conduction, Reverse Bias Conduction, V-I Characteristics – Bipolar Junction Transistor: Operation of NPN and PNP Transistor, Common Emitter Configuration – MOSFET: construction and working principle.

Opto-Electronic Devices and Transducers: Opto-Electronic Devices: Working principle of Photoconductive Cell, Photovoltaic Cell-solar cell Transducers: Capacitive and Inductive Transducer, Thermistors, Piezoelectric and Photoelectric Transducer.

List of Experiments **30 Hours**

Electrical & Electronics:

1) Identification of resistor and capacitor values
2) Soldering practice of simple circuit and checking the continuity
3) Fluorescent tube, staircase and house wiring
4) Characteristics of PN Diode

Civil & Mechanical:

1) Make a wooden Tee joint to the required dimension
2) Make a tray in sheet metal to the required dimension
3) Assemble the pipeline connections with different joining components for the given layout

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply the basic laws and simplification techniques of electrical Engineering in DC and AC Circuits.	Apply
CO2: Summarize the construction and working of Motors, Generator and transformer.	Understand
CO3: Analyze the characteristics of diodes and transistors based on its construction and working principle.	Analyze
CO4: Summarize the working of opto-electronic devices and transducers	Understand
CO5: Examine and report the analysis of different resistors, capacitors, house wiring concepts, wooden joints and pipeline connection.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	-	-	-	-	-	-	1	1	-	-

High-3; Medium-2; Low-1

Textbooks:

T1. R.Muthusubramanian and S.Salivahanan, “Basic Electrical and Electronics Engineering”, McGraw Hill India Limited, New Delhi, 2014.

T2. S. K. Sadhev, “Basic Electrical Engineering and Electronics”, Tata Mcgraw Hill, 2017.

Reference Book(s):

R1. B.L Theraja, “Fundamental of Electrical Engineering and Electronics”, S.Chand Limited, 2022.

R2. J.B.Gupta, “Basic Electrical and Electronics Engineering”, S.K.Kataria & Sons, 2013.

R3. Smarajit Ghosh, “Fundamental of Electrical and Electronics Engineering”, 2nd Edition, PHI Learning Private Limited New Delhi, 2010.

Web References:

1. https://www.nptel.ac.in/courses/108108076
2. https://archive.nptel.ac.in/courses/108/105/108105112
3. https://archive.nptel.ac.in/courses/108/101/108101091

Course Code: 23EEI102		Course Title: Introduction to Electrical and Electronics Engineering (Common to AD, AM, CS, IT & SC) (From 2024 Batch Onwards)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on engineering fundamentals of electric circuits, Electrical machines, and Electron devices.

Module I **23 Hours**

Fundamentals of DC Circuits: Definition, symbol and unit of quantities – Active and Passive elements – Ohm's Law: statement, – Kirchhoff's Laws: statement and illustration – Resistance in series and voltage division rule – Resistance in parallel and current division rule –circuit simplification.

AC Fundamentals: AC Terminologies – Law of electromagnetic induction – Generation of single phase alternating EMF – Root Mean Square (RMS) – Average value of AC

Electrical Machines: Construction and Working Principle of DC shunt Motor, Stepper Motor and single phase transformer

Module II **22 Hours**

Semiconductor Devices: PN junction diode, Forward Bias Conduction, Reverse Bias Conduction, V-I Characteristics – Half wave and Full wave rectifier using diodes – SMPS – UPS - Bipolar Junction Transistor: Operation of NPN and PNP Transistor, Common Emitter Configuration

Opto-Electronic Devices and Transducers: Opto-Electronic Devices: Working principle of Photoconductive Cell, Photovoltaic Cell – LED&LCD display - Thermistors, Thermocouple, and Piezoelectric Transducers.

Fuses – Circuit breaker: MCB, MCCB – Energy efficiency star rating.

List of Experiments **30 Hours**

1. Identification of resistor and capacitor values.
2. Soldering practice of simple circuit and checking the continuity.
3. Staircase and house wiring.
4. Characteristics of PN Diode.
5. Half wave and full wave rectifier using diodes.
6. Characteristics of CE configuration transistor.

Course Outcomes		**Cognitive Level**
At the end of this course, students will be able to:		
CO1:	Apply the basic laws and simplification techniques in electrical engineering using electric circuits.	Apply
CO2:	Make use of the basic laws and principles of electric circuits in analysis of the electrical machines viz.,Motors & transformers, UPS and SMPS	Analyze
CO3:	Analyse the Diodes, Transistors, Opto-Electronic Devices and Transducers	Analyze
CO4:	Investigate and report the analysis of different resistors, capacitors, house wiring concepts.	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	1	1	-	-	-	-

High-3; Medium-2;Low-1

Textbooks:

T1. R.Muthusubramanian and S.Salivahanan, “Basic Electrical and Electronics Engineering”, McGraw Hill India Limited, New Delhi, 2014.

T2. S. K. Sadhev, “Basic Electrical Engineering and Electronics”, Tata Mcgraw Hill, 2017.

Reference Book(s):

R1. B.L Theraja, “Fundamental of Electrical Engineering and Electronics”, S.Chand Limited, 2006.

R2. J.B.Gupta, “Basic Electrical and Electronics Engineering”, S.K.Kataria & Sons, 2009.

R3. Smarajit Ghosh, “Fundamental of Electrical and Electronics Engineering”, 2nd Edition, PHI Learning Private Limited New Delhi, 2010.

Web References:

1. https://www.nptel.ac.in/courses/108108076
2. https://archive.nptel.ac.in/courses/108/105/108105112
3. https://archive.nptel.ac.in/courses/108/101/108101091

Course Code: 23PHL001		Course Title: Physics for Information SciencesLaboratory (Common to AD, AM, CS, IT & SC)	
Course Category: Minor		Course Level: Introductory	
L:T:P (Hours/Week)0:0:3	Credits:1.5	Total Contact Hours: 45	Max Marks: 100

Course Objectives

The course is intended to expose the students to various experimental skills which are very essential for an Engineering student.

List of Experiments: **45 Hours**

1. Determination of wavelength of the Laser using plane transmission grating.
2. Estimation of particle size of fine lycopodium powder using laser.
3. Measurement of acceptance angle and numerical aperture of an optical fiber – Laser diffraction method.
4. Determination of band gap of semiconducting materials – Thermistor (Germanium).
5. Light Illumination characteristics of Light dependent resistor (LDR).
6. Measurement of thickness of thin material – Air wedge method.
7. Determination of wavelength of the spect ral lines of mercury spectrum using grating.
8. I-V characteristics of solar cell.
9. I-V characteristics of photo diode.
10. Verification of truth tables of logic gates.
11. Design of logic gates using discrete components.
12. I-V characteristics of LED.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Elucidate the basic principles involved in the given experiments	Understand
CO2: Conduct, analyze and interpret the data and results from physics experiment	Evaluate

Course Articulation Matrix

CO Vs PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	3	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Reference Book(s):

R1. Physics Laboratory Manual Prepared by Faculty of Physics, Dr. Mahalingam College of Engineering and Technology.

R2. Engineering Physics Laboratory Manual, Dr. R. Jayaraman, V. Umadevi, S. Maruthamuthu, B. Saravanakumar, Pearson India Education Services Pvt. Ltd, 2022.

R3. B.Sc., Practical Physics, C.L. Arora, S. Chand and Co, 2012.

Web References:

1. https://bop-iitk.vlabs.ac.in/List%20of%20experiments.html
2. https://vlab.amrita.edu/index.php?sub=1&brch=281
3. https://vlab.amrita.edu/index.php?sub=1&brch=189

Course Code: 23CSL101		Course Title: Problem Solving using C Laboratory (Common to AD, AM, CS, IT&SC)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours: 45	Max Marks:100

Course Objectives:

The course is intended to enable the students for writing simple programs in C.

List of Experiments: **45 Hours**

1. Develop Algorithm, Flowchart and Pseudo code for given problem.
2. Develop C programs using data types, I/O statements, Operators and Expressions.
3. Develop C programs using Decision-making constructs.
4. Implement C programs using looping statements.
5. Design C programs to implement the concept of arrays.
6. Design C programs to implement the concept of strings
7. Develop C programs using functions.
8. Develop C programs using pointers.
9. Implement the concept of structures using C.
10. Implement C programs to perform file operations.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate proficiency in using development environments, compilers, and debugging tools for C programming	Apply
CO2: Apply C programming concepts to practical programming tasks	Apply
CO3: Demonstrate an understanding of the importance of code efficiency and optimization in C programming	Analyze
CO4: Work as a team in a laboratory environment to develop and demonstrate projects with an oral presentation	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	3	-	3	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	2	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	1	1		3	-

High-3; Medium-2;Low-1

Reference Book(s):

R1. Ashok N.Kamthane, Amit.N.Kamthane, “Programming in C”, 3rd Edition, Pearson Education, 2015.
R2. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Pearson Education, 2013.
R3. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
R4. ReemaThareja, “Programming in C”, Oxford University Press, 2nd Edition, 2016.

Web References:

1. https://electronicsforu.com/resources/15-free-c-programming-ebooks
2. https://www.fromdev.com/2013/10/c-programming-tutorials.html
3. https://books.goalkicker.com/CBook/

Course Code: 23VAL102		Course Title: Wellness for Students (Common to all B.E/B.Tech Programmes)	
Course Category: VAC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0 :2	Credits:1	Total Contact Hours:30	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on setting SMART goals for academic, career and life, applying time management techniques, articulating the importance of wellness for success in life and understanding the dimensions of wellbeing and relevant practices.

Module I **15 Hours**

GOAL SETTING Understanding Vision and mission statements - Writing personal mission statements – „Focus" as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, what you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

TIME MANAGEMENT - TOOLS AND TECHNIQUES Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying „NO" – Managing procrastination.

CONCEPT OF WELLNESS – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods

Module II **15 Hours**

Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

PRACTICES FOR MENTAL WELLNESS

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.

Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas.

PUTTING INTO PRACTICE

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Set well-articulated goals for academics, career, and personal aspirations	Apply
CO2: Apply time management techniques to complete planned tasks on time	Apply
CO3: Explain the concept of wellness and its importance to be successful in career and life	Apply
CO4: Explain the dimensions of wellness and practices that can promote wellness	Apply
CO5: Demonstrate the practices that can promote wellness	Valuing

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	1	1	-	1
CO2	-	-	-	-	-	-	-	-	1	-	1	1
CO3	-	-	-	-	-	-	-	-	1	-	-	1
CO4	-	-	-	-	-	-	-	-	1	-	-	1
CO5	-	-	-	-	-	1	1	-	1	-	-	1

High-3; Medium-2;Low-1

Text Book(s):

T1. Reading material, workbook and journal prepared by PS team of the college

Reference Book(s):

R1. Stephen R Covey, “First things first”, Simon & Schuster UK, Aug 1997 R2. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster UK, 2004.

R3. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, “Value education for harmonious life (Manavalakalai Yoga)”, Vethathiri Publications, Erode, I Ed. (2010).

R4. Dr. R. Nagarathna, Dr. H.R. Nagendra, “Integrated approach of yoga therapy for positive health”, Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.

R5. Tony Buzan, Harper Collins, “The Power of Physical Intelligence English”

Course Code: 23VAT101	Course Title: HERITAGE OF TAMILS (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்ள இயலும்.

CO.2இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்ள இயலும்.

தமிழர் மரபு

அலகு 1 – மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு 2 – மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு 3 – நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4 – தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக் கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5 – இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறபகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுய மரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள்– தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
மாணவர்கள் இப்பாடத்தை கற்றபின்	
CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by:
Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code: 23VAT101	Course Title: HERITAGE OF TAMILS (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.
2. Understand the Contribution of Tamils to Indian National Movement and Indian Culture.

HERITAGE OF TAMILS

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS **3**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS **3**

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE **3**

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.	Understand
CO.2 Understand the Contribution of Tamils to Indian National Movement and Indian Culture.	Understand

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by:
Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

SEMESTER II

Course Code: 23ENI201		Course Title: Communication Skills II (Common to all B.E/B.Tech Programmes)	
Course Category: AEC		Course Level: Introductory	
L:T:P(Hours/Week) 2:0:2	Credits: 3	Total ContactHours:60	Max Marks:100

Course Objectives

The course is intended to impart effective and accurate language in business correspondence on par with B2 level of CEFR Scale.

20 Hours

Module I

Grammar: Linking Words - Collocations –Sentence Completion - Articles - Adverbs- Indefinite Pronoun

Listening: Listening to short conversations - Listening for gist and summarizing - Listening for detail - Responding to straightforward questions.

Speaking: Making statements of facts - Agreeing and disagreeing to opinions - Respond to queries - Group Discussion.

Reading: Read and select (phrasal verbs & relative clause)- Cloze Test - Gapped sentences - Multiple- choice gap-fill

Writing: Paragraph Writing: Descriptive, narrative, persuasive and argumentative - Emails: Giving information - Making enquiries - Responding to enquiries - Power Point Presentation

Module II **20 Hours**

Grammar: Expressions of cause and result – Concord - Error Spotting (Parts of Speech & Indian English) - Prepositions.

Listening: Listening for identifying main points - Responding to a range of questions about different topics - Listening to identify relevant information

Speaking: Empathetic Enunciation – Situation handling – Visual Interpretation ---Short presentations

Reading: Intensive Reading: Comprehending business articles, reports and proposals and company websites-- Open gap-fill Extended reading

Writing: Report Writing - Memo – Complaint letter Business Letters (Seeking permission & Providing Information)

List of Experiments: **20 Hours**

1. Listening to Monologue and Extended Listening Activity I
2. Listening to Monologue and Extended Listening Activity II
3. Expressing Opinions and Situational based speaking
4. Mini Presentation and Visual Interpretation
5. Reading Comprehension
6. Writing letter, email and report

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Identify the common errors in written and spoken correspondence.	Apply
CO2: Develop listening, reading and speaking skills through task based activities in listening, reading comprehension, recapitulation, interpretation and discussion.	Apply
CO3: Read business correspondences like memo, Email, letter, proposals and write reports and website entries and product launches.	Apply
CO4: Perform as an individual and member of a team and engage effectively in group discussion and individual presentation.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	-	-	-

High-3; Medium-2;Low-1

Textbook(s):

T1. Guy Brook- Hart, "Business Benchmark Upper Intermediate", 2nd Edition, South Asian, Cambridge University Press, 2020.

T2. Norman Whitby, "Business Benchmark pre-intermediate to Intermediate", 2nd Edition, South Asian, Cambridge University Press, 2014.

Reference Book(s):

R1. Hewings Martin - Advanced Grammar in use Upper-intermediate Proficiency, CUP,3rd Edition,2013.

R2. Clark David – Essential BULATS (Business Language Testing Service), CUP, 2006.

R3. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, Rachel Godfrey,Gareth Davies, Empower B1+ – Student's Book, Cambridge University Press, 2015.

Web References:

1. https://speakandimprove.com/
2. https://writeandimprove.com/
3. https://www.cambridgeenglish.org/exams-and-tests/linguaskill/

Course Code:23FLT201	Course Title: Foreign Language - Japanese (Common to all B.E/B.Tech Programmes)		
Course Category: AES		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Course Objectives:

The course objectives intended to:

1. Express a basic exposure on Japanese language and culture
2. Express thoughts and communicate in the beginner level of Japanese with native Japanese speaker
3. Identify the kanji etymology as well as use it in basic vocabulary required for the JLPT/NAT 5 examination level
4. Read and write 100 kanji of the official JLPT N5
5. Choose the appropriate verb forms for learning and practicing the Japanese language

UNIT I Introduction to Japan and greetings 9 Hours

Japan : Land and culture - Introduction to Japanese language – Greetings – Seasons - Days of the week - Months of the year – Dates of the month - Self introduction – Numbers (Upto 99,999) – Expressing time – Conversation audio and video.

Listening: Listening to Greetings - Listening for Specific Information: Numbers, Time. Speaking: Self-Introduction

UNIT II Building vocabulary 9 Hours

Family relationships - Colours - Parts of body - Profession - Directions - Time expressions (today, tomorrow, yesterday, day before, day after) - Japanese housing and living style - Food and transport (vocabulary) - Stationery, fruits and vegetables

Listening: Listening for Specific Information: Directions, Family Members, Parts of body Speaking: Introducing one's family.

UNIT III Writing systems 9 Hours

Hiragana Chart 1 - vowels and consonants and related vocabulary – Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary – Introduction to Kanji – Basic Vocabulary – Basic Conversational Phrases.

Listening: Listening to Japanese Alphabet Pronunciation, Simple Conversation. Speaking: Pair Activity (Day to day situational conversation)

UNIT IV Kanji and preposition 9 Hours

Katakana script and related vocabulary – Basic kanjis: naka, ue, shita, kawa , yama , numbers (1- 10, 100, 1000, 10,000 and yen) , person, man, woman, child, tree , book , hidari, migi, kuchi , 4 directions - Usage of particles wa, no, mo and ka and exercises - Usage of kore, sore, are, kono, sono, ano, arimasu and imasu - Particles – ni (location) and ga , donata and dare - Particles ni (time), kara, made , ne , koko, soko, asoko and doko - Directions : kochira, sochira, achira and dochira , associated vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)
Listening: Listening to conversation with related particles

UNIT V Verb forms 9 Hours

Introduction to Verbs - Verbs –Past tense, negative - i-ending and na-ending adjectives introduction - ~masen ka, mashou - Usage of particles de, e , o, to, ga(but) and exercises - Adjectives (present/past – affirmative and negative) – Counters - ~te form
Listening: Listening to different counters, simple conversations with verbs and adjectives.
Speaking: Pair Activity (Explaining one's daily routine by using appropriate particles and verbs)

Course Outcomes **At the end of this course, students will be able to:**	**Cognitive Level**
CO1: Recognize and write Japanese alphabet	Understand
CO2: Comprehend the conversation and give correct meaning	Understand
CO3: Apply appropriate vocabulary needed for simple conversation in Japanese language	Apply
CO4: Apply appropriate grammar to write and speak in Japanese language	Apply
CO5: Speak using words of the Japanese language	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	1	--	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Eri Banno, Yoko Ikeda, Yutaka Ohno, Yoko Sakane, Chikako Shinagawa, Kyoko Tokashiki , “Genki 1 Textbook: An Integrated Course in Elementary Japanese” published by The Japan Times

T2. Eri Banno, “ Genki 1 Workbook: An Integrated Course in Elementary Japanese” published The Japan Times

Reference Book(s):

R1. Japanese for Everyone: Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007

R2. Japanese for Everyone: Elementary Main Textbook1-2, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007

Web References:

1. www.japaneselifestyle.com
2. www.learn-japanese.info/
3. www.learn.hiragana-katakana.com/typing-hiragana-characters/
4. www.kanjisite.com/

Course Code:23FLT202		Course Title: Foreign Language - German (Common to all B.E/B.Tech Programmes)	
Course Category: AEC		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Course Objectives:

The course is intended to:

1. Listen and understand numbers, names and dialogues of a native speaker on par with A1 level.
2. Speak and introduce self in simple sentences to convey their opinion and ideas on par with A1 level.
3. Read simple passages and given text on par with A1 level.
4. Write letter and simple sentences on par with A1 level.

UNIT I	Basic Introduction to German Scripts	9 Hours
Theme and Text (Introduction to German - German script, Deutsche Namen, Daily Greetings and Expressions) – Grammar ('wh' questions, das Alphabet)– Speak Action (Buchstabieren, sich und andere vorstellen nach Namen und Herkunft fragen, internationale Wörter auf Deutsch verstehen, jemanden begrüßen)– pronunciation (Buchstabieren J,V,W,Y, - Long vowels A,E,I,O,U - Pronunciation of Ä,Ü,Ö) – To learn (internationale Wörter in Texten finden, Wörter sortieren) Theme and Text (Gespräche im caf'e, Getränkekarte, Telefon-buch, Namen, Rechnungen) – Grammar (Frägesatze mit wie, woher, wo, was Verben in präsens Singular und Plural, das Verb Sein, Personalpronomen und Verben)– Speak Action (eine Gespräch beginnen sich und andere vorstellen zählen, etwas bestellen und bezhalen Telefonnummern und verstehen)– pronunciation (Wortakzent in Verben und in Zahlen) – To learn (Grammatiktabelle ergänzen, mit einem Redemittelkasten arbeiten)		
UNIT II	**Numbers and Nominative Case**	**9 Hours**
Theme and Text (Numbers – 1 to 12 (Eins bis Zwolf) – 20, 30, 40, 90 (zwanzig-Neunzig) – All Numbers (1-10000) – German Currency (Euro) – Basic Mathematics (plus, Minus, Malen, Geteilt durch)) – Grammar (Introduction of verbs –Have Verb – To Come, To Speak, To Read, To Drive, To Fly, To write, To Eat, To sleep, To take etc.,) Theme and Text (Communication in course) – Grammar (Singular and Plural, Artikel: der,das,die/ ein,eine, verneinung: kein, keine, Komposita: das Kursbuch) – Speak Action		

(Gegenständen fragen/ Gegenstände benennen im kurs:) – pronunciation (word accent Marking, Umlaute ö ä ü hören und sprechen) – To learn (Lernkarten schreiben, Memotipps, Theme and Text (City, Town, Language: Nachbar, Sprachen, Sehenswürdigkeiten in Europa) – Grammar (Past tense for Sein, W-Frage, Aussagesatz und Satzfrage) – Speak Action (about city and siteseeing) – pronunciation (Satzakzent in Frage- und Aussagesätzen) – To learn (eine Regel ergänzen, eine Grammatiktabelle erarbeiten, Notizen machen)		
UNIT III	**Akkusative Case and Prepositions**	**9 Hours**
Theme and Text (Menschen und Hauser, Furniture catalogue, E-Mail, House information) – Grammar (possesivartikel im Nominativ, Artikel im Akkusativ, Adjektive im satz, Graduierung mit zu)– Speak Action (Whonung bescreiben about perons and things)– pronunciation (consonant - ch) – To learn (wortschatz systematisch) Theme and Text (Termine - Appointment and punctuality in Germany) – Grammar (questions with wann?, Preposition (am, um, von... bis), verneinung mit nicht, trennbare verben, präteritum von haben) – Speak Action (Daily plan making, time commitment, excuse for late coming) – pronunciation (consonants- p,b,t,d / k,g) – To learn (Rollenkarten arbeiten) Theme and Text (orientation in working area, go for work, floor plan city plan, office and computer) – Grammar (preposition: in,neben, unter, auf, vor, hinter, an, zwischen, bei und mit + Datic)– Speak Action (work place, work, giving appointments)– pronunciation (consonants: f,w und v) – To learn (Making notice in calender)		
UNIT IV	**Dativ Case and Prepositions**	**9 Hours**
Theme and Text (Holiday and Party, holiday plan, party plan in Germany) – Grammar (regular and iregular verbs) – Speak Action (holiday speak, accident, Ich-Text schreiben) – pronunciation (lange und kurze vokale markieren) – To learn (Text Order) Theme and Text (organising an Excursion to Berlin through city orientation, Bus plan, City plan, post card, Excursion programme) – Grammar (preposition: in, durch, über + Akkusativ: zu, an... vorbei + Dativ, Modalverb wollen) – Speak Action (Tourism, culture, postcard preparation, travel description) – pronunciation (r and l)– To learn (plaket making)Theme and Text (Beruf und all Tag, Visiten karten, wörterbuch) – Grammar – Speak Action (profession, statistic speaking) – pronunciation (n,ng and nk)– To learn (wörterbuch , text information in tabel)		
UNIT V	**Adjectives and Pronunciation**	**9 Hours**
Theme and Text (Haushaltstipp, kochrezept, maße und gewichte, Mahlzeiten und Gerichte) –		

Grammar (jeden Tag, manchmal, nie, Question - welche, Comparison – viel, gut, gern) – Speak Action (about eat, drink question and answers) – pronunciation (e,en,el,er) – To learn (Text auswerten und zusammenfassen)
Theme and Text (Clothing , colour, weather) – Grammar (Adjecktive im Akkusativ, unbestimmer Artikel) – Speak Action (weather, dress and colour understanding) – pronunciation (e-o- ö and ie-u- ü) – To learn (wetter and Farben interkulturelle)
Theme and Text (Clothing , colour, weather) – Grammar (Adjecktive im Akkusativ, unbestimmer Artikel) – Speak Action (weather, dress and colour understanding) – pronunciation (e-o- ö and ie-u- ü) – To learn (wetter and Farben interkulturelle)

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Recognize and write German alphabet, numbers.	Understand
CO2: Comprehend the conversation and give correct meaning	Understand
CO3: Apply appropriate grammar and vocabulary to write and speak.	Apply
CO4: Apply appropriate cases and texts to listen, write and speak.	Apply
CO5: Speak and read using words of the German language	Apply

CO	PO1	PO2	PO3		PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-		-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-		-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-		-	-	-	-	-	-	3	-	1	-	-
CO4	-	-	-		-	-	-	-	-	-	3	-	1	-	-
CO5	-	-	-		-	-	-	-	-	2	3	-	1	--	-

High-3; Medium-2;Low-1

Text Book(s)

T1. Netzwerk, “Deutsch als Fremdsprache” by Stefanie Dengler, Paul Rusch, Helen Schmitz published by Goyal Publishers & Distributors Pvt Ltd;

T2. Funk, Kuhn, Demme, “Studio D A1 Deutsch als Fremdsprache” published by Goyal Publishers & Distributors Pvt Ltd;

Reference Book(s)

R1. Hueber, “Fit for Goethe- Zertifikat A1 (Start Deutsch 1)” by GOYAL PUBLISHERS AND DISTRIBUTORS; 2016

Course Code: 23MAI203		Course Title: Calculus and Transforms (Common to AD, AM, CS, IT & SC)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) : 3: 0 :2	Credits: 4	Total Contact Hours: 75	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on differential calculus, vector calculus, ordinary differential equations, Fourier Series and Z transform to devise engineering solutions to solve real world problems.

Module I **23 Hours**

Differential Calculus: Curvature-Cartesian and Polar coordinates- radius of curvature-center of curvature- circle of curvature- Evolutes and Involutes.

Multivariable Calculus: Partial derivatives-total derivatives-Jacobian- maxima and minima and saddle points- Constrained maxima and minima: Method of Lagrange multipliers-- Gradient-directional derivative- curl and divergence.

Ordinary Differential Equations of Second and Higher Orders: Second and higher order linear differential equations with constant coefficients – Second order linear differential equations with variable coefficients (Cauchy - Euler equation, Legendre's equation) – Method of variation of parameters – Solution of first order simultaneous linear ordinary differential equations.

Module II **22 Hours**

Fourier Series: Dirichlet's condition -Fourier series – Even and odd functions- Half rangesine and cosine series - Parseval's identity -Harmonic Analysis.

Z Transforms: Z transform- region of convergence- properties of z transforms- inverse transform-Solution to homogeneous linear constant difference equations.

List of Experiments(Using suitable software): **30 Hours**

1. Find the radius of curvature of a given curve.
2. Find the extremum value of a given function.
3. Compute second order ordinary differential equation.
4. Find the Fourier series of a periodic function.
5. Compute solution of difference equation using z transform.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply differential calculus to find curvature of a curve, Jacobian, extremum of functions of several variables and vector quantities to solve problems in Science and Engineering.	Apply
CO2: Solve the second and higher order ordinary differential equations using various techniques.	Apply
CO3: Determine the Fourier series of periodic functions and solve finite difference equations using Z-transforms.	Apply
CO4: Develop programs using calculus and transforms concepts through modern tool.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & sons, 2010.

T2. B.S.Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2015.

Reference Book(s):

R1. Veerarajan T., Engineering Mathematics for first year, 3rd edition, Tata McGraw-Hill, New Delhi, 2019.

R2. Srimanta Pal & Subodh C. Bhunia. “Engineering Mathematics”, 1st Edition, Oxford University Press, 2015.

R3. P. Sivaramakrishna Das , C. Vijayakumari , Engineering Mathematics, Pearson India, 2017.

Web References:

1. https://nptel.ac.in/courses/111104092
2. https://www.classcentral.com/course/differential-equations-engineers-13258

Course Code: 23ITT201		Course Title: Data Structures (Common to AD, AM CS, IT &SC)	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week)3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The objective of the course is to impart knowledge of fundamental data structures and how they are implemented. Additionally, learn how to apply the right data structures for solving problems.

Module I **22 Hours**

Linked List: Introduction- Types of Data Structures- Abstract Data type

List ADT: Array Implementation of list - Linked List Implementation list – Doubly Linked List – Circularly Linked List-Applications: Radix sort.

Stack ADT: Stack Model – Array and Linked List Implementation of Stack - Applications: Balancing Symbols - Postfix Expressions- Infix to Postfix Conversion

Queue ADT: Queue Model – Array and Linked List Implementation of Queue-Double ended Queue- Applications of Queue

Trees: Implementation of Trees - Tree Traversals -Binary Trees: Implementation – Expression Trees – Binary Search Tree: Implementation

Module II **23 Hours**

AVL Trees: Implementation -Single Rotation – Double Rotation.

Binary Heap: Min Heap-Max Heap

Graphs: Definitions – Representation of Graphs – Graph Traversals: Breadth First Search – Depth First Search -Topological Sort

Shortest Path Algorithms: Unweighted Shortest Paths -Dijkstra's Algorithm – Critical Path

All Pairs Shortest Path: Floyds Algorithm

Minimum Spanning Tree: Prim's Algorithm – Krushkal's Algorithm.

Internal Sorting:-Insertion Short-Shell Sort-Merge Sort-Quick sort

External sorting: Simple Algorithm-Multiway Merge

Hashing: Hash Functions-Separate Chaining-Open Addressing-Rehashing-Extendible hashing

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Implement principles of Data Structures that efficiently managedynamic collections of data in real-world applications.	Apply
CO2: Categorize the linear data structures list, stack and queue to various applications	Analyze
CO3: Relate the nonlinear data structures trees and graph concepts to various applications	Analyze
CO4: Interpret various internal and external sorting techniques to solve real world problems across different domain	Apply
CO5 : Analyze different hash function properties for efficient data storage and retrieval systems	Analyze
CO6: Develop solutions with ethical standards as a team to the practical problems using Data Structures Concepts	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-			-	-	-	-	-	-	-
CO5	-	-	-	-	2	-	-	-	-	-	-	-
CO6	-	-	3	2	-	-	-	2	2	2	2	2

High-3; Medium-2;Low-1

Text Book(s):

T1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education Asia, New Delhi, 2015.

Reference Book(s):

R1. Sahni Horowitz , “Fundamentals of Data Structures in C”, 2nd Edition Tata McGraw-Hill, New Delhi, 2008.

R2. Seymour “Lipschutz, Data Structures with C”, McGraw Hill, 2014.

R3. Thomas H Cormen, Charles E Leiserson, Ronald L Revest, Clifford Stein, “Introduction to Algorithms” 3rd ed., The MIT Press Cambridge, 2014

Web References:

1. https://www.coursera.org/specializations/data-structures-algorithms
2. https://archive.nptel.ac.in/courses/106/106/106106127/
3. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

Course Code: 23EEI201		Course Title: Digital System Design (Common to AD, AM, CS, IT and SC)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on basics of logic gates, number system and different types of implementation of digital circuits with its simplification methods. Also course describes the analysis of synchronous and asynchronous sequential circuit. At the end of the course the basics in design of computer system is discussed.

Module I **15 Hours**

Number System Representation and Conversion - Logic Gates, Universal Gates - Boolean Algebra and Simplification Techniques: SOP – POS and Karnaugh Map Methods for Boolean Expression Simplification. Implementation of Combinational Logic - Arithmetic Circuits: Full Adder- Full Subtraction - Magnitude Comparator – Multiplexer – De-Multiplexer – Encoder and Decoder.

Module II **15 Hours**

Flip-Flop: RS - JK – T and D – Types of Triggering. Analysis of synchronous sequential circuit - Shift Register. Analysis of asynchronous sequential circuit – Hazards – Static, Dynamic and Essential Hazards Computer System – Computer Memory - Random Access Memory - Read Only Memory - Expanding Memory Capacity –Secondary Storage - Input / Output Devices.

List of Experiments **30 Hours**

1. Verification of Boolean theorems using digital logic gates
2. Implementation of combinational circuits using basic gates
3. Logic verification of half adder and full adder
4. Logic verification of Multiplexer / De-Multiplexer
5. Logic verification of 4 bit shift register
6. Logic verification of 3 bit binary counter

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand the numbers system representation, operation of logic gates and design of computer system	Understand
CO2: Apply the fundamental concepts of Boolean algebra insimplification of digital circuits	Apply
CO3: Design and implement the arithmetic circuits using combinational logiccircuits.	Create
CO4: Analyze the sequential logic circuit and infer the results.	Analyze
CO5: Analyze and interpret the digital circuits by performing hardware implementations and report the inference as a team or individual.	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	1	1	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. M. Morris Mano, “Digital Logic and Computer Design”, 1st Edition, Pearson Publication, New Delhi, 2016.

T2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, 6th Edition, McGraw-Hill, 2011.

Reference Book(s):

R1. Anil K. Maini, “Digital Electronics Principles, Devices and Applications”, John Wiley & Sons,1st Edition, 2007.

R2. Charles H.Roth, Jr. “Fundamentals of Logic Design”, 7th Edition, Jaico publishing House, New Delhi, 2014.

R3. S.Salivahanan and S. Arivazhagan, Digital Circuits and Design, Oxford University Press, 5th Edition, 2018.

R4. Leach P Donald, Albert Paul Malvino and Goutam Saha, “Digital Principles and Applications”, 7th Edition, Mcgraw Hill, 2010.

Web References:

1. http://www.nptel.ac.in/courses/ 108105132
2. https://de-iitr.vlabs.ac.in
3. https://nptel.ac.in/courses/117105080

Course Code: 23MEL001	Course Title: Engineering Drawing (Common to AD,AM,AU,CS,EA ,EC,EE,EV,IT,ME, SC)		
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours: 60	Max Marks:100

Course Objectives:

The course is intended to

- To impart knowledge on basic dimensioning. 2D and 3 D drawings such as points, lines, planes and solids on first quadrant.

Module I **8 Hours**

Basics of Engineering Drawing: Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Basic Geometrical constructions –Orthographic projection- Free hand Sketching.

Projection of Points, Lines: First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces by rotating object method.

Projection of Solids: Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method. Practicing three-dimensional modeling of simple objects by CAD Software (Not for examination).

Module II **7 Hours**

Sectioned Solids: Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other – Orthographic views of sections of simple solids.

Development of Surfaces: Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders using straight line and radial line method.

Isometric Projection: Principles of isometric projection – Isometric scale –Isometric projections of simple solids and truncated solids. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination).

List of Experiments **45 Hours**

1. Lettering & Dimensioning
2. Projection of Points & Lines
3. Orthographic projections
4. Projection of Simple Solids
5. Projection of Section of Simple Solids
6. Development of Surfaces
7. Isometric Projections

Course Outcomes:

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO 1: Apply the concepts related to free hand sketching, orthographic and Isometricprojection in first quadrant.	Understand
CO2: Apply the concepts and draw projections of points in four different quadrants and lines located first quadrant.	Apply
CO3: Apply the concepts and draw projections and sections of simple solids using rotating object method.	Apply
CO4: Apply the concepts and draw lateral surface of simple solids using straight line and radial line development methods.	Apply
CO5: Apply the concepts and draw isometric view of simple solids and truncated solids using principles of isometric projection.	Apply
CO6: Conduct experiments to demonstrate concepts, implement and analyze the drawing concepts using engineering tool: Using AutoCAD.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO6	-	3	-	-	3	-	-	-	1	1	-	1

High-3; Medium-2; Low-1

Textbook:

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, " Engineering Drawing and Design", Tata McGraw Hill India, New Delhi, 3rd edition, 2019.

Reference Book(s):

R1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill India,New Delhi, 2nd edition, 2014.

R2. Dhananjay A. Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata McGraw India, New Delhi, 3rd edition, 2010.

R3. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, Gujarat, 54rd edition, 2023.

Publications of Bureau of Indian Standards

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.IS9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
2. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.IS 11669 – 1986 &SP 46 – 2003: Dimensioning of Technical Drawings.
3. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods. The mode ofdelivery is like practical.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://www.coursera.org/specializations/autodesk-cad-cam-cae-mechanical-engineering

Course Code: 23ITL201		Course Title: Data Structures Laboratory (Common to AD, AM, CS, IT & SC)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objectives:

The objective of the course is to improve students' abilities to create and analyze basic linear and nonlinear data structures. It improves students' capacity to pick and use the ideal data

List of Experiments **45 Hours**

1. Array based implementation of List ADT
2. Array based implementation of Stack ADT and Queue ADT
3. Linked list implementation of List ADT
4. Linked list implementation of Stack ADT and Queue ADT
5. Implementation of Binary Tree traversals
6. Implementation of Binary Search Tree
7. Implementation of Graph traversals
8. Implementation of Floyds Algorithms
9. Implementation of insertion sort
10. Implementation of Quick sort

Course Outcomes	CognitiveLevel
At the end of this course, students will be able to:	
CO1: Implement linear data structure operations using C programs	Apply
CO2: Predict the solution using non-linear data structure data structuresusing C programs	Evaluate
CO3 : Evaluate the efficiency of sorting algorithms using relevant datastructures	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	2	-	-	-	-	-	-	-
CO2	-	2	-	3	3	-	-	-	-	-	-	-
CO3	-	-	2	3	3	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Reference Book(s):

R1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education Asia, New Delhi, 2015.

R2. Sahni Horowitz , “Fundamentals of Data Structures in C”, 2nd Edition Tata McGraw-Hill, New Delhi, 2008.

Web References:

1. https://www.coursera.org/specializations/data-structures-algorithms
2. https://archive.nptel.ac.in/courses/106/106/106106127/
3. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

Course Code:23CSL201		Course Title: IT Practices Laboratory (Common to AD, AM, CS, IT&SC)	
Course Category: SEC		Course Level: Introductory	
L:T:P (Hours/Week) 0:0:4	Credits: 2	Total Contact Hours: 60	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on developing web and mobile applications.

List of Experiments: **60 Hours**

1. Study of Peripheral Devices and PC Hardware.
2. Study of different communication protocols
   - USB
   - HDMI
   - WIFI
   - Bluetooth
3. Develop a web page with image, text, links, tables, Menus, Navigations bars, containers and Media.
4. Construct a web page to display resume.
5. Construct a web page to display the products of a company.
6. Create an application using GUI widgets, Layouts, Media and Event handlers.
7. Develop a calculator application to perform all arithmetic operations.
8. Construct an application to calculate BMI.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify the components of PC hardware.	Understand
CO2: Design and develop websites, mobile applications for the givenscenario using open source tools.	Apply
CO3: Optimize web application performance by considering factors such as page load times, resource usage, and caching mechanisms for ensuring efficient user experiences.	Apply
CO4: Demonstrate the developed web and mobile applications with an oralpresentation.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	3	-	-	-	-	-	-	-	3	-
CO3	-	1	-	-	-	-	2	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	1	1	-	-

High-3; Medium-2; Low-1

Reference(s):

R1. Peter Abel, Niyaz Nizamuddin, “IBM PC Assembly Language and Programming”, Pearson Education, 2007.

R2. Harvey M. Deitel, Paul J. Deitel,“Internet and World Wide Web – How to Program”, 4th Edition ,Pearson Education Asia, 2009.

R3. David Wolber, Hal Abelson, Ellen Spertus, Liz Looney, “App Inventor 2: Create Your Own Android Apps”, 2nd Edition, O'Reilly Media, 2014.

Web References:

1. Open Element Tool: https://www.openelement.uk/index.htm
2. MIT App Inventor Tutorials: https://appinventor.mit.edu/explore/ai2/tutorials

Course Code: 23ESL201		Course Title: Professional Skills 1:Problem solving skills & Logical Thinking 1 (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week)0:0:2	Credits: 1	Total Contact Hours: 30	Max Marks: 100

Course Objectives:

- To enhance the students' numerical, analytical and logical reasoning ability.
- To make them prepare for various public and private sector exams and placement drives.

Module I Quantitative Ability **20 Hours**

Number System and LCM & HCF- Percentage- Ratio and Proportion - Average- Progressions- Ages-Partnership- Mixture & Allegation - Profit and loss- Interest calculation- Data interpretation.

Module II Reasoning Ability **10 Hours**

Seating Arrangement- Linear, circular and Complex – Direction Problems- Blood Relation- Puzzles- Crypt arithmetic- Venn diagrams- Statement and conclusion- Statement and argument- Causes and effects- Self-Learning.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Build the competence in numerical, analytical and logical reasoning ability	Apply

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1: Dr. R. S. Aggarwal. "Quantitative Aptitude for Competitive Examinations" Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

T2: Dr. R. S. Aggarwal. "A Modern Approach to Logical Reasoning", Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018

Reference Book(s):

R1: R. V. Praveen. “Quantitative Aptitude and Reasoning” 2nd Revised Edition, Prentice-Hall of India Pvt.Ltd, 2013

R2: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, McGraw Hill Publications, 5th Edition, 2020

R3: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, McGraw Hill Publications, 6th Edition, 2021

Web References:

1. https://www.indiabix.com/aptitude/questions-and-answers/
2. https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Course Code: 23VAT201	Course Title: TAMILS AND TECHNOLOGY (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்ள இயலும்.

CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்ள இயலும்.

தமிழரும் தொழில்நுட்பமும்

அலகு 1 – நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்

அலகு 2 – வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ஷ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள், பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ – சாரோசெனிக் கட்டிடக் கலை.

அலகு 3 – உற்பத்தித் தொழில்நுட்பம் 3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன் வளம் – முத்து மற்றும் முத்துக் குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு 5 – அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி – கணினித் தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென் பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

Course Outcomes மாணவர்கள் இப்பாடத்தை கற்றபின்	**Cognitive Level**
CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code: 23VAT201	Course Title: TAMILS AND TECHNOLOGY (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.
2. Understand the Scientific Tamil & Tamil Computing.

TAMILS AND TECHNOLOGY

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.	Understand
CO.2 Understand the Scientific Tamil & Tamil Computing.	Understand

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code: 23CHT202	Course Title: Environmental Sciences (Common to all B.E/B.Tech Programmes)		
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week)1: 0: 0	Mandatory Non-Credit Course	Total Contact Hours: 15	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on sustainable utilization of natural resources, prevention of pollution, disaster management and environmental issues & public awareness on ecosystem.

Module I **8 Hours**

Natural Resources

Role of individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

Environmental Pollution and Disaster Management

Role of an individual in prevention of pollution; Disaster management : floods, earthquake, cyclone and landslides.

Environmental Ethics and Legislations

Environmental ethics : Environment Protection Act; Air Act; Water Act ; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation.

Module II **7 Hours**

Environmental Issues and Public Awareness

Public awareness - Environment and human health.

Environmental Activities

(a) Awareness Activities:

i. Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste.
ii. Slogan making event.
iii. Poster making event.

(b) Actual Activities:

i. Plantation.
ii. Cleanliness drive.
iii. Drive for segregation of waste.
iv. To know about the different varieties of plants.
v. Shutting down the fans and ACs of the campus for an hour or so.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the use of natural resources for a sustainable life as an individual in prevention of pollution.	Understand
CO 2: Apply the environmental ethics and legislations for various environmental issues.	Apply
CO 3: Create the public awareness on environment and human health as an individual or team through various activity based learning.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	3	3	-	-	-	-
CO3	3	-	-	-	-	3	3	-	3	3	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi, 2006.

T2. Mackenzie Davis and Susan Masten, "Principles of environmental engineering and science", Mc-Graw Hill, 3rd Edition, 2014.

Reference Book(s):

R1. Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, Enviro Media.

R2. Cunningham, W.P.Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview.
2. https://en.wikipedia.org/wiki/Environmental_science.

SEMESTER III

Course Code: 23MAT305	Course Title: Discrete Mathematics (Common to AM, CS, IT, SC)		
Course Category: Minor		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 2	Credits: 4	Total Contact Periods: 60	Max Marks: 100

Course Objectives:

The objective of the course is aimed to equip engineering students with the mathematical tools and reasoning skills needed for effective problem-solving and analytical thinking in their respective fields.

Module I **22+8 Hours**

Logic: Propositions- Logical operators – Logical equivalences and implications - Normal forms – Rules of inference - Consistency and inconsistency - Theory of Inference – Proofs – Predicates – Quantifiers - Universe of discourse – Validity of arguments..

Relations and Functions: Relations – Types of relations – Properties of relations - Equivalence relations – Relational matrix - Graph of relations – Partial ordering relation - Poset – Hasse Diagram. Functions - Type of functions: Injective, surjective and bijective functions – Composition of functions – Inverse functions.

Combinatorics: Mathematical induction - Basics of counting – Pigeon hole principle – Permutations with and without repetition – Circular permutation – Combinations**.**

Module II **23+7 Hours**

Recurrence relations: Recurrence relations - Solution of linear recurrence relations.

Algebraic Structures: Algebraic Systems – properties – Semi groups and monoids – Groups - Sub groups- Homomorphism – Abelian group – Cyclic group – Normal subgroup and Cosets – Lagrange's theorem – Codes and Group codes.

Divisibility and Congruence: Division Algorithm – Prime and Composite Numbers – Fundamental theorem of Arithmetic - Euclidean algorithm - GCD and LCM – Congruence – Linear congruence – Chinese Remainder Theorem.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply propositional and predicate logic to solve engineering problems and implementing the concepts of sets, relations and functions in discrete structures.	Apply
CO2: Solve problems using combinatorial techniques, such as counting principles, permutations and combinations in the context of algorithm design and analysis.	Apply
CO3: Apply the concepts of groups and its properties to algebraic structures and solve system of linear congruence equations using Chinese Remainder Theorem.	Apply

CO4: Demonstrate a deepened understanding of fundamental concepts such as sets, relations, functions and combinatorics covered in lectures through guided practice.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	1	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. J.P.Trembly, R. Manohar, Discrete Mathematical Structures with applications to Computer Science, 1st edition, TMH International Edition, July 2017.

T2. T.Veerarajan, “Discrete Mathematical Structures with Graph Theory and Combinatorics”, 1st edition, Tata McGraw-Hill Education Private Limited, New Delhi, July 2017.

Reference Book(s):

R1. Kennth H. Rosen, “Discrete Mathematics and Its Applications”, Seventh edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, July 2017.

R2. Ralph P Grimaldi, Ramana. B. V, “Discrete and Combinatorial Mathematics”, Fifth Edition, Pearson Education India, 2011.

Web References:

1. http://nptel.ac.in/courses/106106094
2. https://nptel.ac.in/courses/111/104/111104026/

Course Code: 23SCI301	Course Title: Object Oriented Programming (Common to AM & SC)		
Course Category: Major		Course Level: Intermediate	
L: T: P (Periods/Week) 3: 0: 2	Credits: 4	Total Contact Periods: 75	Max Marks: 100

Course Objectives:

The course is intended to provide knowledge about Object Oriented Programming concepts, basics of Java programming language and make students to develop java applications.

Module I **22 Periods**

Introduction to OOP and Java: Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors - Methods -Access specifiers - Static members- JavaDoc comments.

Inheritance, Packages and Interfaces: Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

Exception Handling: Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception.

Module II **23 Periods**

Multithreading: Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication Suspending – Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.

I/O, Generics, String Handling: I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

JAVAFX Event Handling, Controls and Components: JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Layouts – FlowPane – HBox and VBox . Menus – Basics – Menu – Menu bars – MenuItem.

List of Exercise **30 Periods**

1. Develop a java application using class and objects.
2. Solve the above problem using an interface.
3. Implement exception handling and create user defined exceptions.
4. Write a java program to implements a multi-threaded application.

5. Write a java program to perform file operations.
6. Develop applications using JavaFX controls, layouts and menus.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Differentiate structured programming and object oriented programming and know object oriented concepts like classes, objects, inheritance etc.	Apply
CO2: Develop solutions for problems by applying object oriented programming features and concepts	Create
CO3: Function as a team and built and manage software projects for a problem	Apply
CO4: Develop ethical solutions considering its social environmental impact	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	3	3
CO3	-	-	2	-	3	-	-	-	3	1	3	-	-	-
CO4	-	-	-	-	-	2	2	2	-	-	-	-	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. Herbert Schildt, “Java: The Complete Reference”, 11th Edition, McGraw Hill Education, New Delhi, 2019

T2. Herbert Schildt, “Introducing JavaFX 8 Programming”, 1st Edition, McGraw Hill Education, New Delhi, 2015

Reference Book(s):

R1. Herbert Schildt, “Introducing JavaFX 8 Programming”, 1st Edition, McGraw Hill Education, New Delhi, 2015.

R2. Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11th Edition, Prentice Hall, 2018

Web Reference(s):

1. https://onlinecourses.nptel.ac.in/noc22_cs47/preview
2. https://www.coursera.org/courses?query=java

Course Code: 23SCT301	Course Title: Computer Organization and Architecture (Common to AM & SC)		
Course Category: Major		Course Level: Intermediate	
L: T: P (Periods/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Course Objectives:

The course is intended to teach students to use the functional components and build a computing systems and also make them to build storage systems. The course also teaches the concept of pipelining to design RISC and CISC processors and use the characteristics of processor inter communication and shared memory to build multiprocessors.

Module I **22 Periods**

Functional Units – Basic Operational Concepts – Number Representation and Arithmetic Operations – Character Representation - Performance – Memory Locations and Addresses- Addressing Modes – Instruction Sets – CISC Vs. RISC - Accessing I/O Devices – Interrupts – Bus Structure- Bus Operation – Instruction Execution – Hardware Components – Instruction Fetch and Execution Steps- Control Signals – Hardwired Control - Semiconductor RAM Memories – Read-only Memories – Direct Memory Access – Cache Memory – Mapping Functions- Performance Considerations – Virtual Memory – Memory Management Requirements.

Module II **23 Periods**

Pipeline Organization – Pipelining Issues – Data Dependencies –Memory Delays – Branch Delays –Resource Limitations – Performance Evaluation- Superscalar Operation- Pipelining in CISC and RISC Processors. Characteristics of Multiprocessors – Interconnection Structures –Inter Processor Arbitration – Inter Processor Communication and Synchronization- Cache Coherence- Shared Memory Multiprocessors.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Demonstrate an understanding of the design of the functional units of a digital computer system.	Apply
CO 2: Demonstrate the functionality of semiconductor memories to build a storage system	Apply
CO 3: Design a pipeline for consistent execution of instructions with minimum hazards	Apply

CO 4: Identify suitable characteristics of inter process communication and memory structure to build multiprocessors.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-		-	-	-	-	-	-			
CO2	-	-	3	-		-	-	-	-	-	-		3	3
CO3	-	-	2	-	3	-	-		3	1	3			
CO4	-	-		-		2	2	2	-	-	-			

High-3; Medium-2; Low-1

Text Book(s):

T1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig Manjikian “Computer Organization and Embedded Systems”, Mcgraw Hill Education, 6th edition, 2011

T2. M.Morris Mano, “Computer System Architecture”, Pearson Publication, 2007.

Reference Book(s):

R1. William Stallings, “Computer Organization and Architecture”, 7th Edition PHI, 2010

R2. Daniel J,”Synthesis Lecture on Fault Tolerant Computer Architecure “, Pearson Education, 2019.

R3. Jim Ledin, “Modern Computer”, Pearson Education, 2017.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs88/preview
2. https://www.w3.org/standards/agents/authoring

Course Code: 23SCT302		Course Title: Principles of Communication and Cyber Attacks	
Course Category: Major		Course Level: Intermediate	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Course Objectives:

Design, configure and secure computer networks through the application of layered protocol approaches, diverse communication protocols and effective implementation of physical and data link layers to address real-world challenges and mitigate cyber attacks.

Module I **22 Hours**

Introduction to Networks: Introduction to Computer Networks – Types of Networks – Network Topology - OSI Reference model - layers in the OSI model - TCP/IP protocol suite.

Data Communication: Data and Signals - Periodic Analog Signals - Digital Signals - Transmission Impairment - Data Rate Limits – Performance.

Digital Transmission: Digital-To-Digital Conversion - Analog-To-Digital Conversion - Transmission Modes.

Module II **23 Hours**

Introduction to Physical and Data Link Layer: Switching – Link Layer addressing – Error Detection and Correction – Data link control – Media access control.

Principles of Cyber Attacks: Introduction to cyber-attacks, application security (design, development and testing), operations security, monitoring, identifying threats and remediating them – Browser Attacks – Web Attacks targeting users – Obtaining user or website Data – Email attacks.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify the basic networking concepts and OSI Reference model with TCP/IP.	Apply
CO2: Analyze the physical and Data link layer with its essential components.	Apply
CO3: Identify the various threats and implement strategies to protect systems and users.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	-	-	1	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	1	2	-	1	1	-	-	2	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. Michel A. Gallo and William H. Hancock, “Computer Communications and Networking Technologies”, Pacific Grove, CA : Brooks/Cole, 2002.

T2. Behrouz A. Forouzan,”Data Communications and Networking”, 5th Edition Mc Graw Hill.

Reference Book(s):

R1. M. Barry Dumas, Morris Schwartz, “Principles of Computer Networks and Communications”, Pearson, 2012.

R2. James F. Kurose, K. W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, 3rd Edition, Pearson Education, 2017.

Web References:

1 https://digimat.in/nptel/courses/video/117105143/L01.html

Course Code: 23SCI302		Course Title: Database Design (Common to AM &SC)	
Course Category: Major		Course Level: Intermediate	
L:T:P (Periods/Week) 3: 0: 2	Credits:4	Total Contact Periods:75	Max. Marks:100

Course Objectives:

The course is intended to make students to design and build efficient data storage structures for a given problem and extract required information by using Structured Query Language.

Module I **22 Periods**

Introduction: Database System- Terminologies - Need for DBMS - Data Models and its types - Functions of DBMS- DBMS Architecture- Key issues and Challenges in Database Systems

Relational Model: Structure of Relational Databases-Database Schema-Keys-Schema Diagrams-Relational Query Languages-The Relational Algebra

Database Design Using the E-R Model: Entity-Relationship Model- -Mapping Cardinalities--ER to Relational Mapping Object Relational Mapping - Keys

SQL-Introduction to SQL- Data Definition – Data Manipulation – Data Control - Functions and Procedures- Embedded & Dynamic SQL Triggers- NOSQL - MONGO DB

Module II **23 Periods**

Relational Database Design: Decomposition Using Functional Dependencies- Normal Forms-Functional-Dependency Theory-Algorithms for Decomposition Using Functional Dependencies- Decomposition Using Multivalued Dependencies

Transaction Management: Transactions: Transaction Model-ACID Properties- Serializability-Transactions as SQL Statement- Concurrency Control: Lock -Based Protocols- Deadlock Handling- Timestamp-Based Protocols - Validation-Based Protocols -Recovery System: Recovery and Atomicity - Recovery Algorithm

Query Processing and Optimization: Measures of Query Cost - Selection Operation - Sorting -Join Operation - Evaluation of Expressions-Transformation of Relational Expressions

List of Experiments: **30 Periods**

1. Construct a Database using ER Diagram.
2. Implement DDL and DML commands using SQL queries.
3. Implement Joins and Nested Queries to an existing employee database.

4. Implement triggers and cursors.

5. Design database tables to comply with specific normal forms for a given problem.

6. Implement transaction management- commit, rollback, save points.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the fundamental principles of database and develop ER models for given problem	Apply
CO2: Analyze the given relational tables for anomalies and normalize them	Analyze
CO 3: Analyze various concurrency control and recovery mechanisms suitable for the given database	Analyze
CO 4: Evaluate query cost and optimize them	Analyze

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	2	3	-	-	-	-	-	-	-	-	-	2	3
CO4	-	3	-	-	-	-	-	-	-	-	-	-	2	-

High-3; Medium-2;Low-

Text Book(s):

T1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, 7th Edition, Tata McGraw Hill, March 2019

Reference Book(s):

R1. Raghu Ramakrishnan, “Database Management Systems”, 4th Edition, McGraw-Hill Publications, 2015

R2. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, 6th Edition, Pearson, 2011.

Web References:

1. https://archive.nptel.ac.in/courses/106/105/106105175/
2. https://onlinecourses.nptel.ac.in/noc22_cs91/preview

Course Code: 23SCL301		Course Title: Programming Using Python Laboratory (Common to AM &SC)	
Course Category: Major		Course Level: Intermediate	
L:T:P(Periods/Week) 0:0 :4	Credits: 2	Total Contact Periods: 30	Max Marks: 100

Course Objectives:

The course is intended to teach basic programming structures, Python data structures, file management and application development using various libraries. Additionally teach game development using Pygame.

List of Experiments:

List of Exercises

1. Implementation of data types, operators and expressions.
2. Implementation of string.
3. Implementation of list, tuple and dictionary.
4. Implementation of functions.
5. Implementation of file handling techniques
6. Implementation of class and objects with exception handling
7. Implementation of polymorphism
8. Implementation of Inheritance
9. Implementation of python libraries numpy, pandas, scipy and matplotlib.
10. Implementation of python program to simulate bouncing ball using pygame.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop Python programs for real world problems with suitable techniques.	Apply
CO2: Apply the Python library data structures in logical decision-making problems.	Apply
CO3: Apply the Object-Oriented Programming concepts to build simple intelligent applications.	Apply
CO4: Develop strategic applications to simulate Python games with libraries.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3		-	-	-	-	-	-	-	-	-	3	-
CO3	-	-	3	-	-	-	-	-	-	3	-	-	-	3
CO4	-	1	2	-	3	-	-	-	-	-	-	3	-	-

High-3; Medium-2;Low-1

Reference Book(s):

R1.Michael Knapp, “Python: Programming for Advanced: Learn the Fundamentals of Python”, 2nd June 2017.

R2. Richard Ozer, “Advanced Python Programming: The Insider Guide to Advanced Python Programming Systems” 8th November 2017

R3. Meenu Kohli, “Basic Core Python Programming A Complete Reference Book to Master Python with Practical Applications”, Bpb Publications, 2021.

Web References:

1. https://nptel.ac.in/courses/106106145
2. https://www.udemy.com/course/python-game-development-using-pygame-and-python-3/
3. https://onlinecourses.nptel.ac.in/noc24_cs57/preview

Course Code: 23ESL301		Course Title: Professional Skills 2: Problem solving skills & Logical Thinking 2 (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Periods:30	Max Marks:100

Course Objectives:

The course is intended to enhance the students' numerical, analytical and logical reasoning ability. Also course focus to make learners prepare for various public and private sector exams and placement drives.

Module I **20 Hours**

Quantitative Ability

Time and work –Pipes and cisterns- - Time Speed Distance-Problems on Trains-Boats and Streams- Permutation and Combination-Probability, Mensuration- Heights and distance- Logarithms- Clocks and Calendars – Data Sufficiency

Module II **10 Hours**

Reasoning Ability

Number & Alpha series- Odd man out-Coding and Decoding-Syllogisms- -Problems on Cubes and Dices- Logical Venn diagram -Visual Reasoning- Element & logical series-Analogies

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Enhance their problem solving skills & Logical thinking Skills	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1: Dr. R. S. Aggarwal. "Quantitative Aptitude for Competitive Examinations" Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

T2: Dr. R. S. Aggarwal. "A Modern Approach to Logical Reasoning", Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018

Reference Book(s):

R1: R. V. Praveen. “Quantitative Aptitude and Reasoning” 2nd Revised Edition, Prentice-Hall of India Pvt.Ltd, 2013

R2: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, McGraw Hill Publications, 5th Edition, 2020

R3: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, McGraw Hill Publications, 6th Edition, 2021.

Web References:

1 https://www.indiabix.com/aptitude/questions-and-answers/

2 https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Course Code: 23VAT301		Course Title: Universal Human Values 2: Understanding Harmony	
Course Category: VAC		Course Level: Intermediate	
L:T:P (Hours/Week) 2:1: 0	Credits:3	Total Contact Periods:45	Max Marks:100

Pre-requisites

- Induction Program

Course Objectives

The course is intended to:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Strengthening of self-reflection
3. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
4. Development of commitment and courage to act
5. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

Unit I Introduction to Value Education 9 Hours

Need for the Value Education; Self -exploration as the process for value education; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding: Relationship and Physical Facilities; Happiness and Prosperity: current scenario; Method to fulfill the Basic human aspirations

Unit II Harmony in Human Being 9 Hours

Human being as a co-existence of self (‘I’) and the material ‘Body’; needs of Self ('I') and 'Body'; The Body as an instrument of ‘I’; Harmony in the self (‘I’); Harmony of the self (‘I’) with body; Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III Harmony in the Family and Society 9 Hours

Harmony in the Family the basic unit of human interaction; Values in human to human relationship; Trust as the foundational values of relationship; Respect as the right evaluation ; Understanding harmony in the society (society being an extension of family); Vision for the universal human order.

Unit IV Harmony in the Nature 9 Hours

Understanding the harmony in the Nature Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature; Existence as Co-existence at all levels; Holistic perception of harmony in existence.

Unit V Harmony on Professional Ethics 9 Hours

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics; Case study: holistic technologies, management models and production systems; Strategy for transition towards value-based life and profession

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO2: Appraise physical, mental and social wellbeing of self and practice techniques to promote wellbeing.	Responding
CO3: Value human relationships in family and society and maintain harmonious relationships.	Valuing
CO4:Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO5:Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	1	2	2	-	-	2	-	-
CO2	-	-	-	-	-	1	2	2	2	1	-	2	-	-
CO3	-	-	-	-	-	2	2	2	2	1	-	2	-	-
CO4	-	-	-	-	-	2	2	2	2	-	-	2	-	-
CO5	-	-	-	-	-	1	2	2	2	-	-	2	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Book(s):

R1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2. A.N. Tripathi ,"Human Values", New Age Intl. Publishers, New Delhi, 2004.

R3. The story of stuff, Annie Leonard, Free Press, New York 2010.

Web References:

1. https://aktu.ac.in/hvpe/ResourceVideo.aspx
2. http://hvpenotes.blogspot.com/
3. https://nptel.ac.in/courses/109/104/109104068/

SEMESTER IV

Course Code: 23MAT401		Course Title: Probability and Statistics (Common to EC, EE, ME, AU, CS, AM, SC,IT,CE & EV)	
Course Category: Minor		Course Level: Intermediate	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Periods:60	Max. Marks:100

Course Objectives:

This course aims at providing the student to acquire the knowledge on random variables and probability distributions. They gain knowledge regarding hypothesis testing for data.

Module I **22 + 8 Hours**

Probability and Random Variables: Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables-One Dimensional Randon variables- Probability Mass Function- Probability Density Functions- Properties - Moments- Moment generating functions and their properties- Two Dimensional Random Variables - Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression using least square method – Transformation of random variables.

Standard Distributions: Discrete Distributions - Binomial- Poisson- Properties, Moment generating functions -Continuous Distributions - Uniform –Exponential- Normal Distributions and their properties.

Module II **23 + 7 Hours**

Testing of Hypotheses: Sampling distributions, Estimation of parameters, Statistical hypothesis, Large sample test based on Normal distribution for single mean and difference of means, Tests based on t-test, Chi-square distributions and F distributions for mean, variance and proportion, Contingency table (test for independent), Goodness of fit.

Design of Experiments: Analysis of Variance (ANOVA) - One-way Classification – Completely Randomized Design (CRD) – Two-way Classification – Randomized Block Design (RBD) – Latin square**.**

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1:Demonstrate the concepts of probability theory to engineering problems.	Understand
CO2:Calculate the expected values, variances and correlation coefficient of random variables	Apply
CO3:Use the theoretical discrete and continuous probability distributions in the relevant application areas.	Apply
CO4:Apply the concepts of testing the hypothesis and design of experiments to solve real life problems.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	1	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Veerajan T, “Probability, Statistics and Random process”, 3rd Edition, Tata McGraw-Hill, New Delhi, 2017.

T2. Dr.J.Ravichandran, “Probability and Statistics for Engineers”, 1stEdition, Wiley India Pvt. Ltd., 2010.

Reference Book(s):

R1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, “Probability and Statistics for Engineers and Scientists”, 9th Edition Pearson Education, Asia, 2013.

R2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, “Schaum's Outlines Probability and Statistics”, 4th Edition Tata McGraw Hill edition, 2012.

R3. Morris DeGroot, Mark Schervish, “Probability and Statistics”, Pearson Educational Ltd 4th Edition, 2014.

Web References:

1. https://archive.nptel.ac.in/courses/111/105/111105090/
2. https://archive.nptel.ac.in/courses/111/105/111105041/

Course Code: 23SCI401		Course Title: Basics of Operating Systems (Common to AM &SC)	
Course Category: Major		Course Level: Intermediate	
L:T:P (Hours/Week) 3: 0: 2	Credits:4	Total Contact Periods:60	Credits:4

Course Objectives:

The course is intended to provide knowledge about basics of operating systems Process Management, and its services. The course imparts the fundamental concepts of Memory management and file systems for various administrative tasks in Linux environment

Module I **22 Hours**

Introduction: Computer System Organization– Operating System Operations – Kernel Data Structures–Operating Systems Structures: System Components, Operating System Services, System calls, System Programs – Process Concepts: Process Scheduling, Operation on Process, Co-Operating process, Inter Process Communication.

Process Management: CPU scheduling: Scheduling Algorithms – Process Synchronization: The Critical Section Problem, Peterson's Solution, Hardware Support for Synchronization, Mutex Locks, Semaphores, Monitors – Classical problems of Synchronization – Deadlock: Deadlock Characterization – Methods for handling Deadlocks: Deadlock Prevention, Avoidance, Detection and Recovery from Deadlock

Module II **23 Hours**

Memory Management: Main Memory: Contiguous Memory Allocation, Paging, Structure of Page Table and Swapping –Virtual Memory: Demand paging, Copy-on-write, Page Replacement Algorithms, Allocation of Frames and Thrashing.

File Systems: Mass Storage System: Disk Structure, Disk Attachment, Disk Scheduling – File System Interface: File Concepts, Access methods, Directory Structure, File Protection – File System Implementation: File System Structure and Operations, Directory Implementation, Allocation methods, Free Space Management.

List of Exercise **30 Hours**

1. Implementation of Process and I/O System calls
2. Implementation of CPU Scheduling Algorithms
3. Implementation of Classical Synchronization problems using semaphores
4. Implementation of Memory Allocation Strategies
5. Implementation of Page Replacement Algorithms
6. Implementation of Disk Scheduling Algorithms

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate the working principle of operating system components and its system calls	Apply
CO2: Solve process scheduling and synchronization problems using algorithms	Apply
CO3: Compare different memory management techniques using allocation schemes	Apply
CO4: Develop solutions for free space management using file systems and disk scheduling concepts.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			-	-	-	-	-	-	-	-	-	-	-
CO2		2	3		-	-	-	-	-	-	-	-	-	-
CO3				3	-	-	-	-	-	-	-	-	-	-
CO4		2	3		-	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Abraham Silberschatz, Galvin. P.B. and Gagne. G. “Operating System Concepts”, 10th Edition, John Wiley & Sons, 2018

T2. Andrew S. Tanenbaum, “Modern Operating Systems”, 4th Edition, Pearson Education, 2015.

Reference Book(s):

R1. William Stallings, “Operating Systems Internals and Design Principles”, 9th Edition, Pearson Education, 2018

Web References:

1. https://nptel.ac.in/courses/106/105/106105214
2. https://archive.nptel.ac.in/courses/111/105/111105041/

Course Code: 23SCT401		Course Title: Computer Networks and Attacks	
Course Category: Major		Course Level: Intermediate	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact periods:45	Max. Marks:100

Course Objectives:

The course is intended to provide knowledge about the development of Network components, Implement the network, transport layer protocols. The course imparts the working principles of application layer protocols and the Concepts of Networks Attacks.

Module I **23 Hours**

Network Components: Network Requirements–Bandwidth and Latency – Delay X Bandwidth product – Application Performance needs –Connection Perspectives – Encoding – Framing: (PPP, HDLC, SONET) – Error Detection (Parity, Internet Checksum, CRC)

Network Layer : Internet Protocol (IP) – Service Model – Global Addresses – Datagram Forwarding in IP – Subnetting and Classless Addressing – ARP – DHCP – ICMP – Routing protocols: RIP and OSPF – IPv6 – Distance vector – Link state Routing Algorithm - Mobile IP

Transport Layer: UDP: Segment format, Applications – TCP: Segment Format, Connection Establishment and Termination– TCP Congestion Control – Congestion Avoidance Mechanisms.

Module II **22 Hours**

Application Layer: Electronic Mail: SMTP, MIME, IMAP – World Wide Web: HTTP – Web Services – Infrastructure Services: Domain Name System, Simple Network Management Protocol – Firewalls.

Network Attacks: Security attacks – Active and Passive, Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks, Trojan horse and spyware attacks, Worms Attacks- Firewall.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Illustrate various network components and its performance measures.	Apply
CO2: Identify the Internet protocols in the various layers of OSI Reference Model.	Apply
CO3: Demonstrate the working principles of application layer protocols and its related cyber attacks	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	1	-	-	-	-	-	1	-	-
CO2	-	2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	3	-	1	2	1	1	-	-	2	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. A. S. Tanenbaum “Computer Networks”, 6th edition, Pearson Education/ PHI, New Delhi, India, 2021

T2. William Stallings ,” Network Security Essentials : Applications and Standards.,2014.

Reference Book(s):

R1. Behrouz A. Forouzan,” Data communication and Networking”, 4th Edition, Mc Graw-Hill, India, 2006

R2. Kurose, Ross, “ Computer Networking: A top down approach”, Pearson Education, India.

Web References:

1. http://ocw.mit.edu/courses/

Course Code: 23SCT402		Course Title: Cryptography and Security	
Course Category: Major		Course Level: Intermediate	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods :45	Max. Marks:100

Course Objectives:

The course is intended to provide knowledge about classical encryption techniques and the principles of public-key cryptography. The course imparts the fundamental concepts the use of Message Authentication Codes, security threats and Dos mechanisms.

Module I **22 Hours**

Computer Security and Classical Encryption Techniques -Introduction - Computer Security Concepts – Security Attacks – Security Mechanism –Symmetric Cipher Model – Substitution Techniques – Transposition Techniques.

Symmetric Key Encryption: Block Cipher Structure –Data Encryption Standard – DES Example –strength of DES – Block Cipher Design Principles – AES Structure – AES transformation - AES example –Mode of Operations.

Public Key Cryptography :Principles of Public – Key Cryptosystems –RSA Algorithm – Diffie – Hellman Key Exchange Algorithm – Key Exchange Protocols

Module II **23 Hours**

Hash Functions and Message Authentication Code: Applications of Cryptographic Hash Functions – Hash functions based on Cipher Block Chaining - Secure Hash Algorithm – Message Authentications Requirements -Functions – MACs Based on Block Ciphers DAA and CMAC - Digital Signatures.

Security Threats: Introduction to Security Threats – Virus – Worms – Trojan Horse – Bombs – Trapdoor –Network and Services Attack – Denial-of-Service Attack – Types of DOS Attack – Examples –Electronic Mail Security – PGP – S/MIME - System Security – Intruders – Firewalls, Hands-on practice on cryptographic techniques using CrypTool

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Illustrate the Classical and Asymmetric encryption techniques with respective algorithms.	Apply
CO2: Compute various cryptographic hash functions and message authentication codes.	Apply
CO3: Analyze various security threats and its countermeasures.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	2	2	-	2	-	-	-	-	-	-	-	-
CO2	-	2	3	-	-	-	-	1	1	-	-	-	2	-
CO3	2	-	-	3	-	2	2	-	1	-	-	2	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. William Stallings, “Cryptography and Network security Principles and Practices”, Pearson/PHI,2017.

T2. Wade Trappe, Lawrence C Washington, “ Introduction to Cryptography with coding theory”, Pearson,2021

Reference Book(s):

R1. Forouzan ,”Cryptography And Network Security”,Tata McGrawHill,2015

R2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.2015

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2. https://www.gatevidyalay.com/tag/cryptography-and-network-security-tutorial/
3. https://www.khanacademy.org/computing/computer-science/cryptography/crypt/v/intro-to-cryptography

Course Code: 23SCL401		Course Title: Computer Networks and Cyber Laboratory	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 0:0 :4	Credits: 2	Total Contact Periods: 30	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on network commands, TCP and UDP sockets, Routing protocols and Simulation.

List of Experiments:

1. Implement the various Network Packet analyzer tool

   (i) tcpdump (ii) iperf (iii) Packet capturing and Analyzing (iv) ifconfig (v) nslookup

2. Develop a HTTP web client program to download a web page using TCP sockets using python.
3. Demonstrate Applications using TCP sockets using python.

   (i) Echo client and echo server (ii) Chat (iii) File Transfer
4. Develop a python program for Simulation of DNS using UDP sockets.
5. Develop python a code for simulating ARP /RARP protocols.
6. Simulation of Congestion Control Algorithms using NS3 tool.
7. Analyze the protocol performance using Analyzer tool (WireShark).
8. Develop a python program for Distance Vector/ Link State Routing algorithm.
9. Evaluate the performance of Routing protocols using Simulation tool.
10. Develop a python program for simulation of error correction code.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate network protocol analyzer using various Tools.	Apply
CO2: Develop applications that utilize TCP and UDP for real-time communication.	Create
CO3: Implement and configure Congestion control algorithms using network simulator.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	2	-	-	-	-	-	-	1	-	-
CO2	-	2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	2	-	-	3	2	1	-	-	-	-	-	2	-	-

High-3; Medium-2;Low-1

Reference Book(s):

1. Behrouz A. Forouzan," Data communication and Networking", 4th Edition, Mc Graw-Hill, India, 2006

2. A. S. Tanenbaum "Computer Networks", 6th edition, Pearson Education / PHI, New Delhi, India, 2021

3. Kurose, Ross, "Computer Networking: A top-down approach", Pearson Education, India, 2010.

Web References:

1.https://www.computernetworkingnotes.com/networking-tutorials/basic-networking-commands-explained-with-examples.html

2. https://networksimulator2.com/ns2-program-for-congestion-control/

3. https://networksimulationtools.com/protocol-simulation-tools/

Course Code: 23SCL402		Course Title: Cryptography and Security Laboratory	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 0:0 :4	Credits: 2	Total Contact Periods: 30	Max Marks: 100

Course Objectives:

The course is intended to provide knowledge about classical encryption techniques and the principles of public-key cryptography. The course imparts the fundamental concepts the use of key exchanges mechanisms.

List of Experiments: **30 Hours**

1. Implement the following cipher techniques to perform encryption and decryption using Pycrypt libraries.
   (i) Caesar Cipher (ii) Play fair Cipher (iii)Hill Cipher.
2. Implement the following transposition techniques using Pycrypt libraries.
   (i) Rail fence transformation.
   (ii) Columnar transformation.
3. Implement DES algorithm using CrypTool.
4. Implement AES algorithm using CrypTool.
5. Develop RSA Encryption algorithm using CrypTool.
6. Implement the Diffie-Hellman Key Exchange mechanism. Consider one of the parties as Alice and the other party as bob.
7. Calculate Message Digest of a text using the SHA-1 Algorithm.
8. Calculate Message Digest of a text using the MD5 Algorithm
9. Implement the Signature scheme – Digital Signature Standard.
10. Demonstrate Intrusion Detection System using any tool eg.Snort.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop a various encryption techniques using Pycrypt libraries.	Apply
CO2: Develop the operations of block ciphers with encryption standards using CrypTool.	Apply

CO3: Analyze the implementation of message functions and hash codes.	Apply
CO4: Identify various security threats and denial of service mechanisms.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	1	-	-	-	-	-	1	-	-
CO2	-	2	3	-	2	-	-	-	-	-	-	1	2	-
CO3	-	-	-	3	2	-	-	-	-	-	-	-	-	-
CO4	-	2	3	-	-	1	-	1	1	-	1	2	-	-

High-3; Medium-2;Low-1

Reference Book(s):

R1. Forouzan ,"Cryptography And Network Security",Tata McGrawHill,2015

R2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.2015

Web References:

1.https://onlinecourses.nptel.ac.in/noc22_cs90/preview

2.https://www.gatevidyalay.com/tag/cryptography-and-network-security-tutorial/

Course Code: 23ESL401		Course Title Professional Skills 3: Professional Development and Etiquette (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Intermediate	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Periods:30	Max Marks:100

Course Objectives:

The course is intended to cultivate students' appropriate etiquette across various personal and professional contexts, fostering professionalism and effective communication.

Module I **15 Hours**

Emotional Intelligence

Intrapersonal Skill: Goal Setting- Self-management- Emotional Intelligence: Understanding & Developing EI for Effective Communication and Relationships – Enhancing Social Skills

Professional Development

Introduction to Professional Development - Career State Assessment - Set Career Goals- Stay on Industry Trends - Self & Lifelong learning – Creativity - Problem Solving Skills - Strong Fundamentals – Using/ Creating Opportunities – Work & Life Balancing - Revisiting Goals

Teamness and Interpersonal skills

Paraphrasing: Techniques for Active Listening -Paraphrasing as a Tool for Effective Understanding and Communication – Collaboration and Team Building: Building Trust and Rapport - Self-paced learning.

Module II **15 Hours**

Effective Communication

Effective Verbal Communication - Assertive Communication - Elements of Effective Communication - Barriers to Effective Communication - Persuasion Skills - Effective Presentation: Oral and visual presentation – Drafting formal reports.

Professional Etiquette

Introduction - Types of professional Etiquette- Personal Grooming: Importance of Personal Grooming in Professional Settings- Dress Codes and Professional Appearance Guidelines- Body language - Social – Email – Telephonic – Dining – Classroom - Business.

Activities:

- Emotional Intelligence: Scenario based role play, Debate
- Paraphrasing: Listening, Reading
- Effective Presentation:
  - Oral Presentation: Self-Introduction, JAM , Extempore speech
  - Visual presentation: Email Writing, Power Point Presentation, Vlog
- Professional Etiquette: Demonstrate required Professional Etiquette in all the above activities.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Communicate effectively and exhibit Professional etiquettes in various social forums.	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2	3	-	1	-	-

High-3; Medium-2; Low-1

Text book(s):

T1. Sabina Pillai, Agna Fernandez, “Soft Skills & Employability Skills”, Cambridge University Press

T2. Peggy Post &Peter Post, “The Etiquette Advantage in Business: Personal Skills for Professional Success”, 2nd edition (May 3, 2005), William Morrow.

Reference Book(s):

R1. Ashraf Rizvi, "Effective Technical Communication" 2nd Edition, McGraw-Hill India, 2018

R2. Maithry Shinde, Jyotsna Sreenath, “Life Skills & Personality Development”, Cambridge University Press 2022

Web References:

1. https://www.indeed.com/career-advice/career-development/etiquette-at-work
2. https://www.skillsyouneed.com/interpersonal-skills.html

SEMESTER V

Semester V

Course Code: 23SCT501	Course Title: APPLIED CRYPTOGRAPHY		
Course Category: Major		Course Level: Higher	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Cryptography and Security

Course Objectives

The objective of the course is to identify the basic number theory concepts, the Authenticated key exchange, Key agreement protocols and digital signature schemes.

Module I **22 Hours**

Number Theory: Euclidean Algorithm- Modular Arithmetic – Fermat's and Eulers's Theorem – Testing for Primality – Chinese remainder theorem - Random Number generator.

Digital Signature Schemes: Elgamal – Merkle one-time signature - Elliptic curve Cryptosystem – Rabin one-time signature. Advanced Protocols: Zero Knowledge Proofs - Zero Knowledge Proof of Identity.

Authenticated Key Exchange: Identification and AKE – An encryption-based protocol (PGP) - Password authenticated Key exchange protocol with an online TTP (Kerberos). Protocols for identification and login: Feige-Fiat-Shamir - Schnorr's identification.

Module II **23 Hours**

Identity – Based Key Agreement: Introduction: Identity Based Protocols without Pairings – Pairing Based Key Agreement with Basic Message Format – Explicit Authentication.

Group Key Agreement Protocols: Group Key Agreement Protocols: Diffie Hellman Key Agreement – Station to Station protocol – Elliptic curve Diffie Helman – Integrated Encryption Scheme - TLS – Ipsec.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify the basic number theory concepts and various theorem.	Understand
CO2 :Apply cryptographic number theory and protocol design techniques to construct secure communication systems in real-time applications.	Apply
CO3: Develop authenticated key exchange protocols and Key agreement protocols.	Apply

CO4: Implement various Digital Signature schemes and Encryption based protocols.	Apply

Text Book(s):

T1. William Stallings, “Cryptography and Network Security: Principles and Practice”, 8th edition, Pearson, Global Edition, 2024.

T2. Boneh, Dan, and Victor Shoup, “A graduate course in applied cryptography”, Draft 0.5; 2020

T3. Boyd, Colin, Anish Mathuria, and Douglas Stebila, “Introduction to Authentication and Key Establishment”, Springer, Berlin, Heidelberg; 2020

Reference Book(s):

R1. J. Katz and Y. Lindell, “Introduction to Modern Cryptography”, 3rd ed., CRC Press, 2020.

R2. W. Stallings and L. Brown, “Computer Security: Principles and Practice”, Pearson; 4th edition, 2023.

Web References:

https://www.geeksforgeeks.org/agreement-protocol-in-distributed-systems/

https://www.geeksforgeeks.org/types-of-authentication-protocols/

https://doubleoctopus.com/security-wiki/protocol/key-agreement-protocol-2/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	2	-	-	-	-	-	-	-	-	1	-
CO3	-	3	3	-	-	-	-	-	-	-	2	-	-	1
CO4	-	2	-	2	-	-	-	-	-	-	-	1	-	-

High-3; Medium-2; Low-1

Course Code: 23SCT502	Course Title: SYSTEM SECURITY		
Course Category: Major		Course Level: Higher	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The objective of this course is to understand operating system fundamentals, examine access control security models and policies, identify challenges and defences in database systems, explore functionalities of various types of malware, and investigate the foundations of vulnerabilities and trusted computing.

Module I **22 Hours**

Introduction to Database and Operating Systems: Program vs processes, Transaction recovery and concurrency control in database systems- Schedule, Concurrency control protocols, Deadlock handling. Access control mechanisms in general computing systems - Lampson's access control matrix

Access Control Security Models and Policies: Mandatory access control, Authentication mechanisms in databases, DAC, MAC, RBAC. Auditing in databases, Statistical inferencing in databases, Private information retrieval viewed as a database access problem. Privacy in data publishing, Virtual Private Databases

Challenges, Attacks and Defences In Database Systems: Security and protection in operating systems - access control, auditing, trusted computing base with reference to Multics and the commercial Operating Systems Malware analysis and protection

Module II **23 Hours**

Categories of Malwares: viruses, worms and Trojans, Rootkits, Ransomware, Polymorphic malware, Malware capture and analysis using honeypots.

Vulnerabilities and Trusted Computing: Common vulnerabilities and Exposures, Secure system configuration, Minimal footprint, Security of booting, Trusted computing, Virtualization techniques for security, Mobile Operating Systems security especially in Android.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify the functionalities of access control, security models and policies in Database and Operating Systems	Understand

CO2: Solve the various Challenges, Attacks and Defenses in Database Systems	Apply
CO3: Experiment the functionalities of different types of Malwares.	Apply
CO4: Apply secure configuration practices and trusted computing principles to enhance the security posture of database and operating systems environments.	Apply

Text Book(s):

T1.Charles P. Pfleeger, Shari Lawrence Pfleeger, and Lizzie Coles-Kemp, "Security in Computing," Pearson Education, Sixth Edition, 2023.

T2. Sanil Nadkarni ,"Fundamentals of Information Security", BPB Publications, 1st Edition, November 2022.

Reference Book(s):

R1. C. Diaz, "Database Security: Problems and Solutions", Mercury Learning and Information; 2022.

R2. Tanenbaum, Andrew S., and Herbert Bos. *Modern Operating Systems*, 5th ed., Pearson Education, 2022.

R3. Kaiwan N. Billimoria, *"Linux Kernel Programming"*, Packt Publishing, Birmingham – Mumbai; 2024 (2nd Edition)

R4. R. Anderson, *Security Engineering: A Guide to Building Dependable Distributed Systems*, 3rd ed., John Wiley & Sons; 2020.

Web References:

1. https://www.csis.org/news/cybersecurity-agenda-45th-president
2. https://www.ibm.com/docs/en/i/7.3?topic=security-reference

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	2	-	-	-	-	-	-	2	-	2	-
CO3	-	3	-	-	-	-	2	2	-	-	-	2	-	2
CO4	-	-	2	-	-	-	-	-	-	-	-	1	-	-

High-3; Medium-2; Low-1

Course Code: 23SCT503	Course Title: DISTRIBUTED COMPUTING		
Course Category: Major		Course Level: Higher	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The objective of the course is to develop models of distributed systems, address synchronization and information collection issues, implement distributed mutual exclusion, deadlock detection techniques, agreement algorithms and build various cloud computing models.

Module I **22 Hours**

Introduction To Distributed Communication: Introduction: Definition-Relation to Computer System Components – Motivation – Message -Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System

Logical Time And Global State: Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks- Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction – System Model and Definitions– Snapshot Algorithms for FIFO Channels.

Distributed Mutex And Deadlock: Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart- Agrawala's Algorithm –– Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model.

Module II **23 Hours**

Consensus And Recovery: Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery – Coordinated Checkpointing Algorithm - Algorithm for Asynchronous Checkpointing and Recovery

Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Identify the computation and communication models of distributed systems	Understand
CO2: Experiment distributed mutual exclusion and distributed deadlock detection techniques	Apply
CO3: Solve the Consensus and Agreement Algorithms and build Various cloud computing models	Apply
CO4: Apply synchronization and recovery mechanisms in distributed systems to design scalable and fault-tolerant cloud-based applications.	Apply

Text Book(s):

T1**.** Maarten van Steen, Andrew S. Tanenbaum, *"*Distributed Systems*"*, 4th Edition, distributed-systems.net, 2023.
T2. Ratan K. Ghosh, Hiranmay Ghosh, "Distributed Systems: Theory and Applications Paperback", Wiley, 1st edition, March 2023.

Reference Book(s):

R1: George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, *"*Distributed Systems: Concepts and Design*"*, Fifth Edition (eTextbook), Pearson Education, August 1, 2021.

R2. Andrew S. Tanenbaum, Herbert Bos, *"*Modern Operating Systems*"*, Pearson Education, 5th Edition, 2022

Web References:

https://wiki.sei.cmu.edu/confluence/display/c/SEI+CERT+C+Coding+Standard

https://www.ibm.com/docs/en/txseries/8.2?topic=overview-what-is-distributed-computing

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	2	-	-	-	-	-	2	1	-
CO3	-	2	3	-	-	-	-	-	-	2	-	-	1	-
CO4	2	-	-	2	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Course Code: 23SCL501		Course Title: APPLIED CRYPTOGRAPHY LABORATORY	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Periods: 45	Max Marks:100

Course Objectives

The course is intended to: Experiment the use of CrypTooL and its functionalities and basic Protocol Implementation using Python.

List of Experiments **45 Hours**

1. Implement Euclidean Algorithm, extended version, and mod operations.

2. Implement Fermat and Euler's Theorem: Verify the theorems and apply for finding modular inverse.

3. Implement Fermat and Miller-Rabin probabilistic primality tests in both Python and CrypTool.

4. Solve a system of congruences using Chinese Remainder Theorem.

5. Generate pseudo and cryptographically secure random numbers.

6. Implement Feige-Fiat-Shamir identification protocol.

7. Implement Schnorr identification protocol.

8. Implement Rabin one-time signature scheme.

9. Implement Merkle one-time signature scheme.

10. Create a digital signature for a file using RSA (or DSA) and verify the signature using both Python and CrypTool.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply foundational number theory algorithms to cryptographic primitives.	Apply
CO2: Apply identification and digital signature protocols using Python programming.	Apply
CO3: Apply digital signature generation and verification using Cryptographic tools.	Apply

Reference(s):

R1. ShaffiGoldwasser and MihirBellare, Lecture Notes on “Cryptography: Principles and Apllications”, Springer Verlag.

R2. Wenbo Mao, “Modern Cryptography, Theory and Practice”, Pearson Education (Low Priced Edition)

Course Articulation Matrix

CO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	-	-	-	1	1	-	-	-	-	-	1	-	-
CO2	-	1	-	2	-	-	1	-	-	-	-	-	1	-
CO3	3	2	2	-	2	1	-	1	1	-	1	2	-	2

High-3; Medium-2;Low-1

Course Code: 23SCL502		Course Title: SYSTEM SECURITY LABORATORY	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Periods: 45	Max Marks:100

Course Objectives

The course is intended to:

Develop various access control mechanism in operating Systems and Build the Linux Virtualization and private database.

List of Experiments **45 Hours**

1. Exploring the concepts of binaries, libraries (static and dynamic) and Makefile
2. Implementing the discretionary access control mechanism in operating Systems (linux)
3. Implementing the discretionary access control mechanism in databases (mysql)
4. Construct a web page to display own resume
5. Implement Linux Virtualization (Chroot)
6. Implementing the mandatory access control mechanism (SElinux or AppArmor)
7. Implement Virtual private databases (Oracle label Security).
8. Implement Authentication trees and one-time signatures.
9. Utilize tools like Metasploit to exploit vulnerabilities and its functionalities.
10. Utilize a set of server logs with a few simulated attacks and identify anomalies, potential security breaches.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop the fundamental concepts of static and dynamic libraries.	Apply
CO2: Experiment various access control mechanism in operating Systems.	Apply
CO3: Identify various threats and anomalies using tools like Metasploit.	Apply

Reference(s):

R1. R. Sarma Danturthi, Database and Application Security: A Practitioner's Guide, Pearson; 2024.

R2. Jaeger, Trent. Operating System Security, Vol. 1 of Synthesis Lectures on Information Security, Privacy, and Trust, Springer International Publishing; 2022.

Course Articulation Matrix

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	-	-	-	1	1	-	-	-	-	-	1	-	-
CO2	-	1	-	2	-	-	1	-	-	-	-	-	1	-
CO3	-	2	-	-	2	1	-	1	1	-	1	2	-	2

High-3; Medium-2;Low-1

Course Code: 23ESL501		Course Title: Professional Skills 4: Communication Skills and Interview Essentials (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Course Objectives:

The course is intended to equip students with the necessary skills to effectively communicate in various professional settings and excel in the interview process

Module I **15 Hours**

Resume Building & Portfolio Management

Importance of a Strong Resume - Resume Content Development & Core Components – Formatting and Design - Tailoring and Customization – Proofreading - Portfolio Content, design and Structure : Components & Efficient portfolios – Preparing and Maintaining documents for interview – maintaining repositories - Enhancing Personal Brand - Digital Tools and Platforms

Interview - Dress code, Body Language and Grooming

Dress Code Essentials - Body Language – Facial expression, eye contact, gesture, posture, touch behavior & space- Personal Grooming

Effective Communication

Communication in Diverse Contexts - Presentations – Individual and group presentations - Public Speaking - Visual Aids and Presentation Tools

Module II **15 Hours**

Group Discussion

Introduction & types of Group Discussion – Prerequisites of GD – Techniques and tips of GD - Role of GDs in various professional contexts – GD Etiquettes – Strategies to enhance GD – Mock GD.

Interview Skills

Purpose of an interview - Types of Interviews –Interview Techniques – Interview Etiquette - Planning and Preparation - Mock Interviews with Feedback - Post-Interview Etiquette and Follow-Up

Activities:

Building Portfolio: Resume Building, Updating LinkedIn, Maintaining Repositories.

Effective Presentation:

Oral Presentation: Impromptu speech, Mini Presentation, Picture Perception (Both Speaking and Writing)

Visual presentation: Power Point Presentation, Vlog

Group Discussion: General, Technical

Mock Interview: General, Technical

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Communicate effectively and exhibit required competency in various professional environments and demonstrate proficiency in interview process.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	3	3	-	1	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1. Ashraf Rizvi, "Effective Technical Communication" 2nd Edition, McGraw-Hill India, 2018

T2. Pease, Allan, and Barbara Pease. "The Definitive Book of Body Language." Bantam, 2006.

Reference Book(s):

R1. Cheryl Hamilton, “Communicating for Results: A Guide for Business and the Professions”, 11th edition (1 January 2017), Wadsworth Publishing Co Inc.

R2. Whitcomb, Susan Britton. Resume Magic: Trade Secrets of a Professional Resume Writer. JIST Works, 2010.

R3. Carnegie, D. (2009). The Quick and Easy Way to Effective Speaking. Pocket Books.

Web References:

1 https://www.linkedin.com/pulse/interview-etiquette-dos-donts-interviews-brian-vander-waal-fmy8e/

2 https://www.simplilearn.com/group-discussion-tips-article

Course Code: 23SCP501	Course Title: REVERSE ENGINEERING PROJECT		
Course Category: PROJECT		Course Level: Practice	
L: T: P(Hours/Week) 0: 0: 6	Credits:3	Total Contact Periods:90	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Identify solutions to complex interdisciplinary engineering problems.
2. Use the knowledge of Science, engineering & engineering tools to solve complex interdisciplinary problems relevant to the discipline.

The Objective of project is to enable the student to take up investigate study in the broad field of Computer Science and Engineering to solve relevant social / environment / ethical issues on an individual basis or two / three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R & D work. The assignment will normally include:

1. Survey and study of published literature on the assigned topic.
2. Working out a preliminary Approach to the Problem relating to the assigned topic.
3. Conducting Analysis, Design, Implementing / Modeling / Simulation.
4. Preparing a Written Report of the Study work.
5. Publication of work / finding in standard Journal /Conference.
6. Final Presentation before an expert committee.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Design, develop and implement solutions to complex interdisciplinary engineering problems that are socially relevant, economically viable and environment friendly using appropriate tools and techniques.	Apply
CO2: Work in teams performing different roles for effective accomplishment of project goals following ethical practices.	Apply

CO3: Demonstrate the use of prior knowledge of science and engineering critical reflection and continuous learning to formulate, analyze and investigate problems systematically.	Apply
CO4: Communicate the process, methods and materials, finding results and solutions through reports, presentations and other media in appropriate forums.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	3	3	3	3	-			3	-	3	3
CO2	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO3	3	3	-	3	-	3	3	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-

High-3; Medium-2; Low-1

SEMESTER VI

Semester VI

Course Code: 23SCT601	Course Title: CYBER FORENSICS		
Course Category: Major		Course Level: Higher	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Computer networks and attacks

Course Objectives

The course aims to teach the fundamentals of cybercrime and forensics, covering forensics tools, network and e-mail forensics, ethical hacking techniques, and concepts like social engineering and SQL injection.

Module I **22 Hours**

Introduction To Cyber Crime and Forensics: Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Role of ECD and ICT in Cybercrime - Classification of Cyber Crime. The Present and future of Cybercrime - Cyber Forensics -Steps in Forensic Investigation - Forensic Examination Process - Types of CF techniques - Forensic duplication and investigation - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition

Evidence Collection and Forensics Tools : Processing Crime and Incident Scenes – Digital Evidence - Sources of Evidence -Working with File Systems. - Registry - Artifacts - Current Computer Forensics Tools: Software/ Hardware Tools- Forensic Suite Acquisition and Seizure of Evidence from Computers and Mobile Devices - Chain of Custody- Forensic Tools

Module II **23 Hours**

Analysis and Validation : Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics - Analysis of Digital Evidence - Admissibility of Evidence - Cyber Laws across global - Case Studies

Ethical Hacking and foot printing tools : Introduction to Ethical Hacking - Foot printing and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats – Sniffing – Email Tracking- foot printing tools: Nmap, Maltego, theHarvester.

Ethical Hacking In Web : Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify various concepts of Cybercrime and e-mail forensics techniques.	Understand
CO2: Analyze different Ethical Hacking tools, techniques using Nmap, Maltego tools.	Apply
CO3: Build the concepts of Social Engineering, SQL Injection and hacking mobile platforms.	Apply
CO4:Apply forensic investigation techniques and legal frameworks to analyze and validate digital evidence in cybercrime scenarios.	Apply

Text Book(s):

T1. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, 7th Edition, Cengage Learning, 2024.

T2. Gerard Johansen, “Digital Forensics and Incident Response: Incident Response Techniques and Procedures to Respond to Modern Cyber Threats”, 2nd Edition, Packt Publishing, 2020.

Reference Book(s):

R1. Ric Messier, “CEH v12 Certified Ethical Hacker Study Guide with 750 Practice Test Questions”, 1st Edition, Sybex (Wiley), May 2023.

R2. Albert J. Marcella Jr., “Cyber Forensics: From Data to Digital Evidence”, 1st Edition, Wiley, August 2021.

Web References:

1. https://ipindia.gov.in/writereaddata/Portal/ev/sections-index.html

2. https://forensicresources.org/view-resources/websites

3. https://www.nist.gov/itl/ssd/digital-forensics

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS02
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	2	-	2	-	-	-	-	-	-	-
CO3	3	-	3	-	-	2	-	-	-	-	-	-	-	1
CO4	2	-	-	2	-	-	-	3	-	-	-	2	1	-

High-3; Medium-2; Low-1

Course Code: 23SCT602	Course Title: NETWORK SECURITY		
Course Category: Major		Course Level : Higher	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Computer Networks and Attacks

Course Objectives

The objective of the course is to understand essentials of networking security, authentication protocols, security standards, network attack prevention, IP and web security.

Module I **22 Hours**

Fundamendals of Network Security

Overview of networking security- Security Services -Confidentiality, Authentication, Integrity, Non- repudiation, access Control - Availability and Mechanisms- Security Attacks -Interruption, Interception, Modification and Fabrication.

Authentication and Security

Authentication overview - Authentication protocols - Authentication and key establishment - key exchange - mediated key exchange - User Authentication –password-based authentication - password security - Certificate Authority and key management - digital signatures - digital Certificates.

Protocol Standards and Intrusion Detection System

Protocols and Standards- Intrusion Detection System-Snort, Signature and Anomaly based detection, Honeypots and Honeynets, Network Log management-syslog or SPLUNK; RBAC: Role mining; DNS-Dig tool: DNSSEC-DS and NSEC records

Module II **23 Hours**

Security Attacks

Buffer overflow attacks & format string vulnerabilities - Denial-of-Service Attacks -Hijacking attacks: exploits and defenses - Internet worms – viruses – spyware –phishing – botnets - TCP session hijacking - ARP attacks - route table modification - UDP hijacking - man-in-the-middle attacks.

Ip Security And Web Security

Network defense tools: Firewalls,VPNs, Intrusion Detection, and filters - Email privacy: Pretty Good Privacy (PGP) and S/MIME - Network security protocols in practice- Introduction to Wireshark – SSL - IPsec, and IKE -DNS security- Secure Socket Layer (SSL) and Transport Layer Security (TLS) - Secure Electronic Transaction (SET)

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	

CO1: Identify the key concepts of network security and access control mechanisms.	Apply
CO2: Develop proficiency in security protocol standards and various Authentication measures.	Apply
CO3: Experiment various network security attacks and provide countermeasures against security threats.	Apply
CO4: Apply network security tools and cryptographic protocols to design secure communication systems and detect intrusions in real-time network environments.	Apply

Text Book(s):

T1. William Stallings, “Cryptography and Network Security: Principles and Practice”, 9th Edition, Pearson, 2024.

T2. William Stallings, “Network Security Essentials: Applications and Standards”, 6th Edition, Pearson, 2022..

T3. Charlie Kaufman, Radia Perlman , Mike Speciner , Ray Perlner ,”Network Security: Private Communications in a Public World”, Pearson, 3rd Edition ,February 2024.

Reference Book(s):

R1. William Stallings, “Cryptography and Network Security: Principles and Practice”, Pearson, 8th Edition 2022.

R2. Andrew Hoffman, “Web Application Security: Exploitation and Countermeasures for Modern Web Applications”, O’Reilly Media, 1st Edition 2020.

Web References:

1. https://www.nist.gov/itl/applied-cybersecurity/nice/resources/online-learning-content
2. https://www.ibm.com/topics/network-security

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	2	-	-	-	2	-	-	-	-	-	1
CO3	-	3	3	-	2	-	-	-	-	-	2	-	1	-
CO4	2	-	2	-	-	2	-	-	-	-	-	2	1	-

High-3; Medium-2; Low-1

Course Code: 23SCL601	Course Title: ADVANCED PROTOCOL ENGINEERING AND SECURITY LABORATORY		
Course Category: Major		**Course Level: Higher**	
L:T:P(Hours/Week) **0: 0: 3**	**Credits: 1.5**	**Total Contact Periods: 45**	**Max Marks:100**

Pre-requisites:

- Computer Networks

Course Objectives

The course aims to develop skills in building protocol headers, implementing hashing, understanding Denial-of-Service attacks, and mastering encryption and authentication methods for secure communication.

List of Experiments **45 Hours**

1.Installing and configuring NS3 (Network Simulator) and analyze its functionalities.

2. Analysis of Network Latency in a Simple Point-to-Point Connection using NS3

3. Compare the performance of AODV and DSR routing protocols using NS3

4. Using Wireshark explore the different protocol headers and analyze network traffic

5. Create a network with static routing Configuration.

6. Create a network with Dynamic Routing Protocol. (any one)

7. Use Snort rules to detect and prevent email-related security threats such as spam and phishing.

8. Create a testbed with both normal and malicious traffic using tools like Snort or Suricata.

9.Analyze the security vulnerabilities of different network protocols.

10.Analyze the performance of different protocols in real time applications (eg. Video Streaming and Online gaming)

11.Explore different IPv6 transition mechanisms and assess their impact on network performance during the transition from IPv4 to IPv6.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Implement the various functionalities using Network Simulator 3	Apply
CO2: Analyze the network traffic and Email traffic using Wireshark tool	Apply

CO3: Create a network with static and Dynamic protocol configuration.	Apply

Reference(s):

1. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, 8th Edition, Pearson Education,2021.
2. Rajesh M., “NS-3 Network Simulator for Beginners: Simulation of Wireless Network Scenarios”, 1st Edition, Amazon Kindle Direct Publishing,2020.

Web Reference:

https://www.javatpoint.com/wireshark

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	2	-	-	-	-	-	-
CO2	-	-	-	2	3	-	-	2	-	-	-	-	1	-
CO3	-	-	3	-	-	-	3	-	-	-	-	2	-	1

High-3; Medium-2;Low-1

Course Code: 23SCL602		Course Title: NETWORK SECURITY LABORATORY	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Periods: 45	Max Marks:100

Pre-requisites:

- Computer Networks

Course Objectives

The course aims to implement network security commands, implement role-based access control, develop packet sniffing techniques, and apply error correction methods.

List of Experiments **45 Hours**

Firewall Configuration and Testing

1. Implement the basic pfSense Firewall Configuration using pfSense to filter traffic based on source/destination IP, ports, and protocols. Tools: pfSense (installed on a physical machine or virtual machine).

2.Set up NAT in pfSense to allow internal devices with private IPs to communicate with the internet using a public IP.

3.Configure Intrusion Detection/Prevention Systems (IDS/IPS) using pfSense with Snort or Suricata.

4.Use pfSense as a DHCP server to assign IP addresses automatically to clients in the network.

5.Set up VLANs (Virtual LANs) in pfSense to segregate network traffic into different virtual networks.

Penetration Testing

6. Perform a basic password cracking operation on a set of password hashes.

7.Perform a dictionary attack using a custom wordlist to crack password hashes.

8.Simulate DoS and Distributed Denial of Service (DDoS) attacks to study their impact on a network using Tools: LOIC, HOIC, hping3.

9.Identify vulnerabilities in a network using scanning tools using Tools: Nmap, OpenVAS, Nessus.

10.Explore vulnerabilities in wireless networks and configure secure wireless communication.

Course Outcomes	

At the end of this course, students will be able to:	**Cognitive Level**
CO1: Implement Firewall concepts using tool like pfSense and build various functions using pfSense tools	Apply
CO2: Demonstrate Firewall configuration using pfSense tool.	Apply
CO3: Identify network vulnerabilities using various scanning tools.	Apply

Reference(s):

1. William Stallings, “Network Security Essentials: Applications and Standards”, 6th Edition, Pearson, 2022.
2. Raphaël Hertzog, Jim O'Gorman, Mati Aharoni, “Kali Linux Revealed: Mastering the Penetration Testing Distribution”, 1st Edition, Offensive Security,2017.

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	-	3	-	-	2	3	-	2	-	-	-	3	-	1
CO3	-	-	2	-	-	-	2	-	-	-	-	3	2	-

High-3; Medium-2;Low-1

Course Code:23ESL601		Course Title: Professional Skills 5: Ace and Elevate : Aptitude and Soft Skills (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level:Higher	
L:T:P (Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours: 30	Max Marks: 100

Course Objectives:

To enhance students' problem-solving skills in the aptitude segment while also equipping them with effective communication skills for professional settings and success in the interview process.

Module I Verbal Ability & Effective Communication **15 Hours**

Verbal Ability

Parts of Speech – Tenses – Subject Verb Agreement – Synonyms – Antonyms – Idioms and Phrases - One Word Substitution – Reading Comprehension – Cloze test – Error Spotting.

Verbal Enhancement

Self-Introduction – Just A Minute- Picture Perception - Writing Skills: Sentence Types (Simple, Compound, Complex), Email drafting.

Campus to Corporate

Professional Grooming –Group Discussion – Impromptu – Interview.

Module II Quantitative & Reasoning Ability **15 Hours**

Quantitative Ability

Simplification & Approximation, Number System, Percentage, Averages, Ratios and Proportion, Ages, Profit & Loss, Interest Calculation, Time and work, Time, speed and distance, Clocks and Calendar, Mixtures and alligation, Permutations and Combinations, Probability, Mensuration, Data Interpretation, Data Sufficiency

Reasoning Ability

Seating Arrangement, Blood relations, Directions Problems, Syllogisms, Number & Alpha Series, Coding and Decoding, Non Verbal Reasoning, Analogies, Cubes and Dices.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Exhibit strong problem-solving skills in the aptitude segment while enhancing their communication abilities for professional settings, enabling them to excel in interviews and placement processes.	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	3	3	-	1	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1: Technical Communication, 3E: Principles and Practice book. Authors. Meenakshi Raman, Sangeeta Sharma, 2006

T2: Pease, Allan, and Barbara Pease. "The Definitive Book of Body Language." Bantam, 2006.

T3: Dr. R. S. Aggarwal. “Quantitative Aptitude for Competitive Examinations” Sultan Chand & Sons Pvt. Ltd, New Delhi, 2024

T4: Dr. R. S. Aggarwal. “A Modern Approach to Verbal and Non-Verbal”, Sultan Chand & Sons Pvt. Ltd, New Delhi, 2024

Reference Book(s):

R1: Cheryl Hamilton, “Communicating for Results: A Guide for Business and the Professions”,

R2: Whitcomb, Susan Britton. Resume Magic: Trade Secrets of a Professional Resume Writer. JIST Works, 2010.

R3: Carnegie, D. (2009). The Quick and Easy Way to Effective Speaking. Pocket Books.

R4: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, McGraw Hill Publications, 5th Edition, 2020

R5: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, McGraw Hill Publications, 6th Edition, 2021.

Web References:

1. https://www.linkedin.com/pulse/interview-etiquette-dos-donts-interviews-brian-vander-waal-fmy8e/
2. https://www.simplilearn.com/group-discussion-tips-article
3. https://talentbattle.in
4. https://www.geeksforgeeks.org/aptitude-questions-and-answers/

VERTICALS

Course Code: 23SCE002	Course Title: Web Interface Design		
Course Category: Major		Course Level : Higher	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course aims to provide a comprehensive understanding of UI/UX design foundations, visual principles, user experience concepts, and hands-on skills in wireframing, prototyping, testing tools, and research methods for creating scenarios and user stories.

Module I **23 Hours**

FOUNDATIONS OF DESIGN: UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.

FOUNDATIONS OF UI DESIGN: Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.

FOUNDATIONS OF UX DESIGN: Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals

Module II **22 Hours**

WIREFRAMING, PROTOTYPING AND TESTING: Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.

RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE: Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate the foundational principles of UI & UX design	Apply

CO2: Apply visual and UI principles in design projects.	Apply
CO3: Develop wireframes, prototypes, and testing workflows in UI & UX.	Apply
CO4: Utilize research methods to create scenarios and user stories for user-centric designs.	Apply

Text Book(s):

T1. Joel Marsh, “UX for Beginners”, O’Reilly , 2022

T2. Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services”

O’Reilly 2021

Reference Book(s):

R1. 1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3 rd Edition , O’Reilly 2020

R2. 2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018

Web References:

1. https://www.nngroup.com/articles/
2. https://www.geeksforgeeks.org/difference-between-ui-and-ux-design/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	-	1	3	-	-	-	2	2	-	2	2	-
CO2	2	-	3	-	3	-	-	-	3	-	-	2	-	1
CO3	-	2	-	-	3	-	2	1	-	-	-	2	-	-
CO4	-	-	-	-	3	-	-	1	-	-	3	2	2	-

High-3; Medium-2; Low-1

Course Code: 23SCE008	Course Title: Machine Learning Techniques for Cyber Security		
Course Category: Major		Course Level: Higher	
L: T: P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Periods:60	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

To enable students to apply machine learning models and techniques for detecting and analyzing cyber threats, malware, and network intrusions in real-world security environments.

Module I **15 Hours**

Introduction to Machine Learning: Introduction to Machine learning and Cyber Security - Cyber Threat Landscape-The Cyber Attacker's Economy – Adversaries Using Machine Learning – Real - World Uses of Machine Learning in Security, Limitations.

Classifying and clustering: Machine Learning - Problems and approaches, - Examples of Machine Learning Models - Training Algorithms to Learn - Model families, Loss Functions, Optimization.

Supervised Classification Algorithms: Logistic Regression, Decision Trees, Random Forests, Support Vector Machines, Naïve Bayes, k - Nearest Neighbors, Neural Networks

Practical Considerations in Classification - Selecting a Model Family - Training Data Construction – Feature Selection - Overfitting and underfitting – Clustering – Algorithms - Evaluating Clustering Results.

Module II **15 Hours**

Anomaly Detection: Feature Engineering for Anomaly Detection - Anomaly Detection with Data and Algorithms - Challenges of Using Machine Learning in Anomaly Detection - Practical System Design Concerns.

Malware Analysis: Understanding Malware – Defining Malware Classification – Feature Generation.

Network Traffic Analysis: Theory of Network Defense - Machine Learning and Network Security - Building a Predictive Model to Classify Network Attacks - Adversarial Machine Learning - Example Models.

List of Experiments: **30 Hours**

1. Implementation of Anomaly Detection using Isolation Forest.
2. Implementation of Naïve Bayes for Email Spam Detection.
3. Implementation of Clustering of Network Traffic using k-Means.
4. Implementation of Malware Classification Using Opcode Frequencies.
5. Implementation of Neural Network for Intrusion Detection.
6. Implementation of Anomaly Detection in Login Attempts using Auto encoders.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1. Apply supervised and unsupervised machine learning algorithms to classify and cluster cybersecurity data.	Apply
CO2. Apply anomaly detection techniques and feature engineering methods to identify abnormal patterns in security data.	Apply
CO3. Apply machine learning models to analyze malware and network traffic for detecting and mitigating cyber threats.	Apply

Text Book(s):

T1. Chio, Clarence, and David Freeman. Machine learning and security: Protecting systems with data and algorithms. “O’Reilly Media, Inc.", 2018.

Reference Book(s):

R1. Emmanuel Tsukerman, “Machine Learning for Cybersecurity Cookbook: Over 80 recipes on how to implement machine learning algorithms for building security systems using Python” Packt Publishing (22 November 2019)

R2. Clarence Chio & David Freeman, “Machine Learning and Security: Protecting Systems with Data and Algorithms”, O’Reilly Media (2018).

Web References:

1. https://www.coursera.org/learn/machine-learning-and-emerging-technologies-in-cybersecurity

2. https://www.sans.org/cyber-security-courses/applied-data-science-machine-learning/

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	-	2

High-3; Medium-2; Low-1

Course Code: 23SCE020	Course Title: Malware and Reverse Engineering		
Course Category: Major		Course Level: Higher	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to: To provide in-depth understanding of malware types, behavior, analysis techniques, and response mechanisms to detect, analyze, and mitigate malware threats effectively.

Module I **23 Hours**

Introduction to Malware: History and Evolution of Malicious Software -Types of Malwares: Viruses, Worms, Trojans, Backdoor, Botnet, Rootkit, Launcher, Spam-sending malware - Malware Lifecycle: Infection, Propagation, Execution - Common Malware Techniques: Obfuscation, Encryption.

Malware Reverse Engineering: Introduction to Reverse Engineering - Assembly Language Basics for Malware Analysts -Disassemblers and Decompilers - Dynamic Analysis Tools: Debuggers, Profilers-Code Reversing and Patching.

Malware Persistence and Evasion Techniques: Malware Persistence Mechanisms - Rootkits and Bootkits - Anti-Analysis Techniques Polymorphic and Metamorphic Malware - DLL Injection and Code Injection

Module II **22 Hours**

Advanced Malware Analysis: Advanced Dynamic Analysis Techniques - Sandbox Evasion Techniques - Malware Cryptography and Steganography - Shellcode Analysis - Exploit Analysis - Android Malware Analysis.

Malware Incident Response and Mitigation: Incident Response in Malware Attacks - Malware Incident Handling Procedures - Malware Forensics: Disk and Memory Analysis – Network - Based Malware Incident Response.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply knowledge of malware types and lifecycle stages to identify and analyze malicious behavior in software systems.	Apply

CO2: Apply static and dynamic analysis techniques using appropriate tools to reverse engineer and interpret malware functionality.	Apply
CO3: Apply incident response and forensic analysis methods to detect, investigate, and mitigate malware-related security breaches.	Apply

Text Book(s):

T1. ”Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software" by Michael Sikorski, Andrew Honig, No Starch Press; 1st edition (1 February 2012)

T2. Monnappa K A, “Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware”, Packt Publishing; 1st edition (29 June 2018)

T3: “Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code " Michael Hale Ligh, Steven Adair, Wiley,2010.

Reference Book(s):

R1. “Malware: Fighting Malicious Code", Ed Skoudis and Lenny Zeltser, Pearson, November 7, 2003.

R2: “The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory " Michael Hale Ligh, Wiley,2014

R3: Malware Forensics: Investigating and Analyzing Malicious Code Cameron H. Malin, Eoghan Casey, James M. Aquilina, Syngress,2008.

Web References:

https://www.udemy.com/course/malware-analysis-and-reverse-engineering

https://www.coursera.org/learn/malware-analysis-and-assembly

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO2	2	-	-	2	-	-	-	-	-	-	-	-	-	1
CO3	-	3	3	-	-	-	-	-	-	-	2	-	-	-

High-3; Medium-2; Low-1

Course Code: 23SCE025	Course Title: Foundations of Ethical Hacking		
Course Category: Major		Course Level: Higher	
L: T: P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Periods:60	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

This course will provide participants with a comprehensive understanding of cryptocurrency and blockchain, covering fundamental concepts, various cryptocurrencies, and blockchain architecture.

MODULE I: **15 HOURS**

Introduction: Ethical Hacking Overview - Role of Security and Penetration Testers- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing- Network and Computer Attacks - Malware - Protecting Against Malware Attacks- Intruder Attacks - Addressing Physical Security

Foot Printing, Reconnaissance and scanning networks: Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.

MODULE II: **15 Hours**

ENUMERATION AND VULNERABILITY ANALYSIS: Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss.

SYSTEM HACKING: Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade.

NETWORK PROTECTION SYSTEMS: Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network- Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.

LIST OF EXERCISES: **30 Hours**

1. Install Kali or Backtrack Linux / Metasploitable/ Windows XP

2. Practice the basics of reconnaissance.

3. Using FOCA / SearchDiggity tools, extract metadata and expanding the target list.

4. Aggregates information from public databases using online free tools like Paterva's Maltego.

5. Information gathering using tools like Robtex.

6. Scan the target using tools like Nessus.

7. View and capture network traffic using Wireshark.

8. Automate dig for vulnerabilities and match exploits using Armitage

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Demonstrate understanding of ethical hacking principles, TCP/IP networking, and common network and malware-based attacks.	Understand
CO2: Apply footprinting, reconnaissance, and scanning techniques using appropriate tools to gather and analyze network and system information.	Apply
CO3: Apply enumeration and vulnerability assessment techniques on Windows, Linux, and embedded operating systems using suitable tools.	Apply
CO4: Analyze and secure network systems by configuring protective mechanisms like firewalls, IDS/IPS, and web filters, and by implementing incident response strategies.	Apply

Text Book(s):

T1. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" (2nd Edition) by Dafydd Stuttard and Marcus Pinto, Wiley, 2021.

T2. "CEH Certified Ethical Hacker All-in-One Exam Guide" (4th Edition) by Matt Walker, McGraw-Hill Education, 2021.

Reference Book(s):

R1. "CompTIA Security+ Guide to Network Security Fundamentals" (8th Edition) by Mark Ciampa, Cengage Learning, 2021.

R2*: '*The Hacker Playbook 3: Practical Guide To Penetration Testing" by Peter Kim, CreateSpace Independent Publishing, 2021*.*

Web References:

1.https://www.kali.org/

2.https://www.udemy.com/course/the-complete-ethical-hacking-course-beginner-to-advanced/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO2	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO3		3	3	-	-	-	-	-	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	2	2	-	-	-	-	1

High-3; Medium-2; Low-1

Course Code: 23SCE026	Course Title: Vulnerability assessment and penetration testing		
Course Category: Professional Elective		Course Level: Introductory	
L: T: P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Periods:60	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

To develop practical expertise in ethical hacking, penetration testing methodologies, and securing web applications against evolving cyber threats.

Module I **15 Hours**

Penetration Testing and Tools: Social Engineering Attacks: How a Social Engineering Attack Works, Conducting a Social Engineering Attack, Common Attacks Used in Penetration Testing, Preparing Yourself for Face-to-Face Attacks, Defending Against Social Engineering Attacks.

Physical Penetration Attacks: Need of Physical Penetration, Conducting a Physical Penetration, Common Ways into a Building, Defending Against Physical Penetrations.

Insider Attacks: Conducting an Insider Attack, Defending Against Insider Attacks.

Metasploit: The Big Picture, Getting Metasploit, Using the Metasploit Console to Launch Exploits, Exploiting Client-Side Vulnerabilities with Metasploit, Penetration Testing with Metasploit's Meterpreter, Automating and Scripting Metasploit, Going Further with Metasploit.

Managing a Penetration Test: Planning a Penetration Test, Structuring a Penetration Testing Agreement, Execution of a Penetration Test, Information Sharing During a Penetration Test, Reporting the Results of a Penetration Test.

Module II **15 Hours**

Web Application Security Vulnerabilities: Overview of Top Web Application Security Vulnerabilities, Injection Vulnerabilities, Cross-Site Scripting Vulnerabilities, The Rest of the OWASP Top Ten, SQL Injection Vulnerabilities, Cross-Site Scripting Vulnerabilities. **Vulnerability Analysis: Passive Analysis:** Source Code Analysis, Binary Analysis.

Client-Side Browser Exploits: Why Client-Side Vulnerabilities are Interesting, Internet Explorer Security Concepts, History of Client- Side Exploits and Latest Trends, Finding New Browser-Based Vulnerabilities, Heap Spray to Exploit, Protecting Yourself from Client-Side Exploit.

List of Exercises: **30 Hours**

1. Internal Penetration Testing

a. Mapping

b. Scanning

c. Gaining Access through CVEs

d. Sniffing POP3/FTP/Telnet Passwords

e. ARP Poisoning

f. DNS Poisoning

2. External Penetration Testing

a. Evaluating External Infrastructure

b. Creating Topological Map & Identifying IP Address of Target

c. Lookup Domain Registry for IP Information

d. Examining Use of IPv6 at Remote Location

3. Network-Based Vulnerability Scanning using Nmap & OpenVAS.

4. Host-Based Vulnerability Scanning with Credentialed Access.

5. Web Application Scanning using OWASP ZAP.

6. Database Vulnerability Detection using SQLMap.

Text Book(s):

T1. Pranav Joshi & Deepayan Chanda, "Penetration Testing with Kali Linux", BPB Publications, 2021.
T2. Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Wiley, 2nd Edition, 2011.

Reference Book(s):

R1. Matthew Hickey, Jennifer Arcuri, "Hands-On Hacking: Become an Expert at Next-Gen Penetration Testing and Purple Teaming", Wiley,1st edition, 2011.
R2. Michal Zalewski, "The Tangled Web: A Guide to Securing Modern Web Applications", No Starch Press,1st edition, 2011.

Web References:

1. https://owasp.org/www-project-web-security-testing-guide/

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Understand the architecture of cyberspace and the evolution of internet and web technologies.	Understand

CO2: Identify various types of cyber-crimes and explain relevant cyber laws and legal frameworks.	Apply
CO3: Analyze security challenges in social media and digital payment systems with best practices.	Apply
CO4: Apply basic cybersecurity measures for securing devices, networks, and data.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO2	2	-	-	2	-	-	-	-	-	-	-	-	1	-
CO3	-	3	3	-	-	-	-	-	-	-	2	-	-	-
CO4	-	2	-	-	-	-	-	2	2	-	-	-	-	-

High-3; Medium-2; Low-1

Course Code: 23SCE030		Course Title: Real Time Cyber Security	
Course Category:Major		Course Level: Higher	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

This course on Real-Time Cyber Security is designed to equip students with the knowledge and skills needed to protect systems and data in real-time against cyber threats.

Module I **23 Hours**

Introduction: Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

Attacks and Countermeasures: OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

Reconnaissance: Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

Module II **22 Hours**

Intrusion Detection: Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

Intrusion Prevention: Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Describe the evolution of cyber security, types of cybercrimes, the impact of the internet, and the importance of the CIA triad and cyber laws, including the Indian IT Act.	Understand
CO2: Apply appropriate tools and techniques to identify cyber threats, perform reconnaissance, and analyze malicious attacks and vulnerabilities.	Apply
CO3: Demonstrate the ability to perform reconnaissance, scanning, and footprinting using ethical hacking tools and techniques.	Apply
CO4: Analyze and implement intrusion detection and prevention strategies using firewalls, IDS/IPS, honeypots, and security policies.	Analyze

Text Book(s):

T1. Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021.

T2. James Graham, Ryan Johnson, and Richard Domingues," Cybersecurity and Cyber Threats", Wiley,1st edition 2021

Reference Book(s):

R1. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”,4th Edition, Jones & Bartlett Learning Publishers, 2021.

R2. Daniel G. Graham, “Ethical Hacking: A Hands-On Introduction to Breaking In”, No Starch Press, 2021.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_me108/preview
2. https://nptel.ac.in/courses/106/103/106103165/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO2	2	-	-	2	-	-	-	-	-	-	-	-	1	-
CO3	-	3	3	-	-	-	-	-	-	-	2	-	-	-
CO4	-	2	-	-	-	-	-	2	2	-	-	-	-	-

High-3; Medium-2; Low-1

OPEN ELECTIVES

Open Electives (Offered to other Programs)			
Course Code: 23SCO001	**Course Title: CYBER LAWS**		
Course Category: Open Elective		**Course Level : Introductory**	
L: T: P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

Explore the legal foundations of cyberspace, including the Information Technology Act, 2000, electronic commerce, cyber crimes, and the legal implications of emerging technologies.

Module I **23 Hours**

Introduction to Cyber Laws: Definition and Scope of Cyber Laws-Historical Development - Cyber Crime and its Classification-Key Legal Frameworks in India-International Perspectives on Cyber Laws-Cyber Jurisdiction and its Challenges-Regulatory Authorities in Cyber Space-Role of Judiciary in Cyber Law Cases-Cyber Ethics and Governance

Information Technology Act, 2000: Overview of the Information Technology Act, 2000- Digital Signatures and Certificates- Offenses and Penalties under the IT Act- Cyber Regulations Appellate Board- Intermediaries and their Legal Liability - Data Protection and Privacy Issues– Recent Amendments and Case Studies.

E-Commerce and Cyber Contracts: Legal Framework for E-Commerce in India- Electronic Contracts and their Validity- Consumer Protection in E-Commerce- Cyber Fraud and E-Banking Regulations- Intellectual Property Issues in Cyberspace- Domain Names and Trademark Protection- Emerging Trends in E-Commerce Laws

Module II **22 Hours**

Cyber Crimes and Investigations: Types of Cyber Crimes- Hacking and Unauthorized Access- Identity Theft and Cyber Stalking- Cyber Espionage and National Security- Challenges in Cyber Crime Investigations- Cyber Crime Reporting Mechanisms- Case Studies and Legal Precedents

Emerging Issues in Cyber Laws: Artificial Intelligence and Legal Implications- Internet of Things (IoT) and Regulatory Challenges- Deepfake Technology and Legal Consequences- Cyber Warfare and International Law- Social Media Regulations- Future Trends and Policy Recommendations.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand the legal foundations, frameworks, and governance of cyberspace.	Understand
CO2: Interpret the key provisions of the Information Technology Act, 2000, across different scenarios.	Understand
CO3: Apply legal knowledge to assess electronic commerce practices and identify various types of cyber crimes.	Apply
CO4: Analyze and apply legal perspectives to evaluate the implications of emerging digital technologies.	Apply

Text Book(s):

T1. Pavan Duggal ,"Cyber Law in India", Bloomsbury India publication, 2021

T2. Rodney D. Ryder, Lexis Nexis,"Information Technology Law in India" ,2022

Reference Book(s):

R1. S. Ravi “Cyber Laws and IT Protection" ,Publisher: Wolters Kluwer, Year of Publication: 2020

R2. Brett Trout ,”Cyber Crimes and the Law" ,Publisher: Apress, Year of Publication: 2018.

Web References:

1. https://intellipaat.com/blog/what-is-cyber-law/

2 https://cybercrime.gov.in/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	2
CO2	2	-	-	2	-	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	2	2	-	-	-

High-3; Medium-2; Low-1

Course Code: 23SCO002	Course Title: Digital Watermarking and Steganography		
Course Category: Open elective		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

Explore the fundamentals and implementation of information hiding techniques, including steganography and watermarking, through comparative analysis, practical embedding methods, and security/authentication mechanisms.

Module I **27 Hours**

Introduction: Information Hiding, Steganography and Watermarking – History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems. watermarking models & message coding: Communication based models – Geometric models

Watermarking With Side Information & Analyzing Errors: Informed Embedding – Informed Coding – Structured dirty-paper codes – Message errors – False positive errors – False negative errors – ROC curves – Effect of whitening on error rates.

Perceptual Models: Evaluating perceptual impact – General form of a perceptual model – Examples of perceptual models – Robust watermarking approaches – Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients

Module II **18 Hours**

Watermark Security & Authentication: Security requirements – Watermark security and cryptography – Attacks – Exact authentication – Selective authentication – Localization – Restoration.

Steganography: Steganography communication – Notation and terminology – Informationtheoretic foundations of steganography – Practical steganographic methods – Minimizing the embedding impact – Steganalysis.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand the Fundamentals of Information Hiding, Steganography, and Watermarking.	Understand

CO2: Compare and Evaluate Different Watermarking Systems Based on Specific Criteria	Apply
CO3: Experiment with Embedding and Coding Techniques in Practical Watermarking Scenarios.	Apply
CO4: Develop Watermark Security and Authentication Mechanisms.	Apply
CO5: Implement the Basics of Steganography and Its Practical Applications	Apply

Text Book(s):

T1. "Digital Watermarking and Steganography: Fundamentals and Techniques" Frank Y. Shih, CRC Press, 2018.

T2. Frank Y. Shih, “Digital Watermarking and Steganography: Fundamentals and Techniques”, 2nd Edition, CRC Press, 2020.

Reference Book(s):

R1. Frank Y. Shih, “Digital Watermarking and Steganography: Fundamentals and Techniques”, 2nd Edition, CRC Press, 2017.

R2. Peter Wayner, “Disappearing Cryptography – Information Hiding: Steganography & Watermarking”, Morgan Kaufmann Publishers, New York, 2002.

Web References:

1.https://www.sciencedirect.com/book/9780123725851/digital-watermarking-and-steganography

2. https://ieeexplore.ieee.org/document/9187785

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	2
CO2	2	-	-	2	-	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	2	2	-	-	-
CO5	-	-	-	-	2	-	2	-	-	-	-	2

High-3; Medium-2; Low-1

Course Code: 23SCO003	Course Title: Criminal Psychology And Behavioral Intelligence		
Course Category: Open elective		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

Explore the scope and historical development of criminal psychology, examine theories and motivations behind criminal behavior, discuss the application of profiling and behavioral intelligence in investigations, explain forensic psychology's role in legal proceedings, and illustrate the use of behavioral science in crime prevention and counterterrorism.

Module I **23 Hours**

Introduction to Criminal Psychology: Definition and Scope-Historical Development-Theories of Crime Causation-Criminal Profiling Psychopathy and Antisocial Behavior-Ethics in Criminal Psychology-Forensic Psychology and the Legal System-Emerging Trends in Criminal Psychology

Understanding Criminal Behavior: Criminal Motivations-Typologies of Offenders-Criminal Personality Traits-Behavioral Analysis in Crime Scenes -Criminal Modus Operandi-Serial Offenders vs. Spree Killers-Victimization and Criminal Behavior-Cultural and Societal Influences

Behavioral Intelligence and Profiling: Introduction to Behavioral Intelligence-Role of Profiling in Investigations-Criminal Investigative Analysis (CIA) Creating Offender Profiles-Crime Scene Analysis-Linkage Analysis-Geographic Profiling-Challenges in Behavioral Intelligence

Module II **22 Hours**

Forensic Psychology in Legal Proceedings: Expert Witness Testimony-Competency and Insanity-Eyewitness Testimony and Memory-Jury Selection and Decision-Making-False Confessions and Interrogation Techniques-Psychiatric Evaluations in Criminal Cases-Mitigation Strategies in Sentencing-Mental Health in Correctional Settings

Applied Behavioral Science and Prevention: Behavioral Analysis in Threat Assessment-Profiling in Cybercrime-Behavioral Science in Counterterrorism-Crime Prevention Strategies-Rehabilitation and Recidivism-Community Policing and Behavioral Insights-Ethics in Applied Behavioral Science.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Summarize the scope and historical development of criminal psychology.	Understand
CO2: Examine theories, motivations, and typologies of criminal behavior.	Understand
CO3: Apply forensic psychology principles in legal proceedings and the criminal justice system.	Apply
CO4:Apply behavioral science techniques in crime prevention and counterterrorism strategies.	Apply

Text Book(s):

T1. Brent E. Turvey, "Criminal Profiling: An Introduction to Behavioral Evidence Analysis" Publisher: Academic Press,2011.

T2. David Canter ,"Forensic Psychology: A Very Short Introduction" ,Oxford University Press, 2010.

Reference Book(s):

R1. James Julian, "Criminal Psychology: Understanding the Criminal Mind and Its Nature Through Criminal Profiling" ,Create Space Independent Publishing Platform, 2016.

R2. Mark Costanzo and Daniel Krauss ,"Forensic and Legal Psychology: Psychological Science Applied to Law", Worth Publishers, 2018.

Web References:

1.https://www.udemy.com/course/criminalpsychology/?utm_source=bing&utm_medium=udemyads&utm_campaign=BG-

2.https://www.researchgate.net/publication/354991065_Criminal_Psychology_Understanding_Criminal_Behaviour

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	2
CO2	2	-	-	2	-	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	2	2	-	-	-

High-3; Medium-2; Low-1

Course Code: 23SCO004	Course Title: Biometric And Security		
Course Category: Open elective		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

Explore the principles of biometrics, discuss various biometric modalities and their characteristics, design and implement biometric systems, analyze security threats, and develop creative solutions using biometrics.

Module I **23 Hours**

Introduction to Biometrics and Security: Definition and Principles of Biometrics-Types of Biometric Modalities-Biometric System Components-Challenges and Concerns -Legal and Ethical Considerations -Emerging Trends in Biometric Security

Biometric Modalities: Fingerprint Recognition-Iris Recognition-Facial Recognition -Voice Recognition-Palmprint Recognition-Retina and Ocular Recognition-Behavioral Biometrics-Multimodal Biometrics

Biometric System Design and Implementation: Biometric Database Management-Feature Extraction and Matching Algorithms-Template Protection and Encryption-Biometric System Integration-Performance Evaluation Metrics-Usability and Accessibility-Human Factors in Biometric Systems-Biometric Standards and Protocols

Module II **22 Hours**

Biometric Security: Threats and Countermeasures: Spoofing and Presentation Attacks-Biometric Data Privacy-Template Storage and Transmission Security-Biometric Cryptography-Biometric Key Management-Secure Biometric Template Protection-Continuous Authentication

Recent Trends: Biometrics in IoT and Wearables- Biometrics and Blockchain-Ethical Hacking for Biometric Security- Quantum Biometric Security-User-Centric Biometrics

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the principles of biometrics.	Understand
CO2: Summarize various biometric modalities and their characteristics.	Understand
CO3: Design and implement of biometric systems	Apply

CO4: Analyze and counteract security threats and challenges in biometric systems.	Apply
CO5: Develop creative solutions using biometrics	Apply

Text Book(s):

T1. Anil K. Jain, Arun A. Ross, Karthik Nandakumar, “Introduction to Biometrics”, 2nd Edition, Springer, 2024

T2. Anne K. Watson and Samuel P. Watson , “Biometric Security and Privacy: Opportunities & Challenges in The Big Data Era",Springer, 2017.

Reference Book(s):

R1 Anil K. Jain, Patrick Flynn, and Arun A. Ross ,"Handbook of Biometrics" ,Springer,2007.

R2. "Biometrics in Support of Military Operations: Lessons from the Battlefield" ,National Research Council ,National Academies Press, 2014.

Web References:

1. https://www.kaspersky.com/resource-center/definitions/biometrics
2. https://www.geeksforgeeks.org/what-is-biometric-authentication/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	2
CO2	2	-	-	2	-	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	2	2	-	-	-
CO5	-	-	-	-	2	-	2	-	-	-	-	2

High-3; Medium-2; Low-1

Course Code: 23SCO005	Course Title: Security Audit and Risk Assessment		
Course Category: Open elective		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

Explore the basics of information security performance metrics and audits, explain audit tasks and reports, demonstrate the importance of vulnerability management, build plans for information security assessments, and implement configuration management and control policies.

Module I **23 Hours**

Information Security Performance Metrics and Audit: Introduction to Security Audit- Servers and Storage devices-Infrastructure and Networks, Communication Routes- Information Security Methodologies (Black-box, White-box, Greybox), Phases of Information Security Audit and Strategies-Ethics of an Information Security Auditor etc.

Information Security Audit Tasks and Reports: Information Gathering -Vulnerability Analysis-External Security Audit-Internal Network Security Audit-Firewall Security Audit-IDS Security Auditing-Social Engineering Security Auditing-Web Application Security Auditing, Information Security Audit Deliverables & Writing Report.

Vulnerability Management: Information Security Vulnerabilities – Threats and Vulnerabilities, Human-based Social Engineering-Computer-based Social Engineering, Social Media Countermeasures, Vulnerability Management – Vulnerability Scanning, Testing, Threat management, Remediation etc.

Module II **22 Hours**

Information Security Assessments: Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability Assessment Solutions &Considerations, Vulnerability Assessment Reports – Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops etc.

Configuration Reviews: Introduction to Configuration Management-Configuration Management Requirements-Plan Control-Development of configuration Control Policies- Testing Configuration Management

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the basics of Information Security Performance Metrics and Audit	Understand
CO2:Summarize Information Security Audit Tasks and Reports	Understand
CO3: Demonstrate the importance of Vulnerability Management	Apply
CO4:Build the plan for Information Security Assessments	Apply
CO5: Implement configuration management and control policies.	Apply

Text Book(s):

T1. Andrew Vladimirov, Konstantin Gavrilenko, Andriej Michajlowski, “Assessing Information Security: Strategies, Tactics, Logic and Framework”, 2nd Edition, IT Governance Publishing, 2015.

T2. Douglas J. Landoll,“ Security Risk Assessment Handbook: A Complete Guide for Performing Security Risk Assessments”, Auerbach Publications, 2nd Edition,2011.

Reference Book(s):

R1. David Alexander, Amanda Finch, and David Sutton, "Information Security Management Principles" ,BCS Learning & Development Limited, 2019.

R2. "NIST Special Publication 800-37: Guide for Applying the Risk Management Framework to Federal Information Systems" ,NIST National Institute of Standards and Technology, 2018.

Web References:

1.https://thisvsthat.io/risk-assessment-vs-security-audit

2https://www.getastra.com/blog/security-audit/security-risk-assessment/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	2
CO2	2	-	-	2	-	-	-	-	-	-	-	-
CO3	-	3	3		-	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	2	2	-	-	-
CO5	-	-	-	-	2	-	2	-	-	-	-	2

High-3; Medium-2; Low-1

DIVERSIFIED ELECTIVES

Course Code: 23AUE050		Course Title: Entrepreneurship Development	
Course Category: Minor		Course Level: Higher	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks:100

Course Objectives:

The course is intended to develop entrepreneurial mindset and skills by identifying and validating problems through human-centered design, analyzing markets and customers to create value propositions and MVPs, exploring business models with financial and feasibility analysis, and preparing investible pitch decks to attract stakeholders.

Module I **22 Hours**

Entrepreneurial Mindset

Introduction to Entrepreneurship: Definition – Types of Entrepreneurs – Emerging Economics – Developing and Understanding an Entrepreneurial Mindset – Importance of Technology Entrepreneurship – Benefits to the Society.

Opportunities

Problems and Opportunities – Ideas and Opportunities – Identifying problems in society – Creation of opportunities – Exploring Market Types – Estimating the Market Size, - Knowing the Customer and Consumer - Customer Segmentation - Identifying niche markets – Customer discovery and validation; Market research techniques, tools for validation of ideas and opportunities

Activity Session: Identify emerging sectors / potential opportunities in existing markets - Customer Interviews: Conduct preliminary interviews with potential customers for Opportunity Validation - Analyse feedback to refine the opportunity.

Prototyping & Iteration

Prototyping – Importance in entrepreneurial process – Types of Prototypes - Different methods – Tools & Techniques. Hands-on sessions on prototyping tools (3D printing, electronics, software), Develop a prototype based on identified opportunities; Receive feedback and iterate on the prototypes.

Module II **23 Hours**

Business models & pitching

Business Model and Types - Lean Approach - 9 block Lean Canvas Model - Riskiest assumptions to Business Models – Using Business Model Canvas as a Tool – Pitching Techniques: Importance of pitching - Types of pitches - crafting a compelling pitch – pitch presentation skills - using storytelling to gain investor/customer attention.

Activity Session: Develop a business model canvas for the prototype; present and receive feedback from peers and mentors - Prepare and practice pitching the business ideas- Participate in a Pitching Competition and present to a panel of judges - receive & reflect feedback

Entrepreneurial Ecosystem

Understanding the Entrepreneurial Ecosystem – Components: Angels, Venture Capitalists, Maker Spaces, Incubators, Accelerators, Investors. Financing models – equity, debt, crowdfunding, etc, Support from the government and corporates. Navigating Ecosystem Support: Searching & Identifying the Right Ecosystem Partner – Leveraging the Ecosystem - Building the right stakeholder network

Activity Session: Arrangement of Guest Speaker Sessions by successful entrepreneurs and entrepreneurial ecosystem leaders (incubation managers; angels; etc), Visit one or two entrepreneurial ecosystem players (Travel and visit a research park or incubator or makerspace or interact with startup founders).

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply entrepreneurial mindset principles to identify societal problems and transform them into viable business opportunities.	Apply
CO2: Develop prototypes using suitable tools and techniques for the validated opportunities through iterative processes.	Apply
CO3: Demonstrate a Business Model Canvas using the Lean approach and pitch the startup idea effectively using storytelling and presentation skills.	Apply
CO4: Analyze customer segments, market size, and niche markets to validate entrepreneurial opportunities through market research and customer interviews.	Analyze
CO5: Evaluate the role and components of the entrepreneurial ecosystem to identify and engage the right ecosystem partners and funding models for startup success.	Analyze

Reference Book(s):

1.Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha Entrepreneurship, McGrawHill, 11th Edition,2020.

2.Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business,2011.

3.Blank, S. G., & Dorf, B. The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch.2012.

4.Roy, R. Indian Entrepreneurship: Theory and Practice. New Delhi: Oxford University Press,2017.

5.Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons,2010.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	1	-	-	-	-	-	-		
CO2	-	-	3	-	1	-	-	-	-	-	-	-		
CO3	-	-	3	-	-	-	-	-	1	1	-	-		
CO4	-	3	-	-	-	-	-	-	-	-	-	-		
CO5	-	-	-	2	-	-	-	-	-	-	1	1		

High-3; Medium-2; Low-1

Course Code: 23AUE051	Course Title: Design Thinking and Innovation		
Course Category: Major		Course Level: Practice	
L:T:P: 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objective:

The course is intended to equip learners with practical skills in design thinking, empathy, prototyping, testing, and implementation for user-centered innovation and effective product development.

Module I **(17+ 6 hrs)**

Introduction- Importance of Design Thinking, Human Centered Design, Six-Step Design Thinking Process-Framework for Innovation-DT-a nonlinear process.

Empathy-importance of empathy in design thinking- empathy vs sympathy- steps of empathize-understanding customer needs-empathy methods and tools-empathy map-5W 1H framework-empathize in UX/UI Design-users Interview

Module II **(18+4 hrs)**

Prototype: Introduction to Proof of concept-MVP-Prototype and its types-prototype methodology- innovation and its types-Tools for prototyping: concept sketching/CAD/3D Printing.

Testing: Importance of testing in product development-design validation-market analysis: TAM-SAM-SOM-EVG.

Implementation - redesign of solution and iterative process.

List of activities

Core Stream

Empathy

1. What challenges does the user face daily commuting to work place?

2. What are the user’s biggest frustrations when interacting with vehicle maintenance engineer?

3. Understand the user for building old age home.

Define

1. A construction site supervisor needs better real-time communication tools because delayed updates cause safety risks. (Provide the empathy data)

2. “Drivers get confused by inconsistent road signs,” create: “How might we improve road sign clarity to reduce driver confusion?”

3. A daily commuter needs a safer way to cross busy intersections because current pedestrian signals are confusing and slow. (Provide the empathy data)

Ideate

1. Develop a creativity safer vehicle dashboard design

2. Develop an improved road drainage system

3. Design an innovative solution to reduce urban flooding caused by heavy rains.

4. Design a Hybrid engine designs incorporating solar panels on the car roof.

Prototype

1. Prototype development (both low fidelity and high fidelity) on any real world problem

IT and Circuit Stream:

Activity 1:

Students role-play as designers and users- create an empathy map with 4 quadrants: *Says, Thinks, Does, Feels*

Circuit Stream- Empathy Interview and Persona Creation

Define- development of problem Statement-Elements of a Good Problem Statement-Tools: Point-of-View (POV) Statements-How Might We (HMW) Questions-User Personas.

Ideation in Design Thinking-Importance of Ideation-Metrics of ideation -tools: Brainstorming-Mind Mapping-SWOT.

Activity 2:

IT Stream- SWOT analysis on software project idea.

Circuit Stream -Idea Pitch Canvas using Brainstorming + Mind Mapping

Convert ideas into quick prototypes and validate through early testing.

Activity 3:

IT Stream -Build a simple algorithm to test feasibility- TAM-SAM-SOM market analysis chart

Circuit Stream -MVP Canvas and Concept Sketching

Circuit Stream -Iterative Redesign and Peer Testing Sprint

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply design thinking tools like empathy mapping, problem definition, and ideation to create user-centered innovative solutions.	Apply
CO2: Apply prototyping, innovation, testing, and iterative redesign techniques in product development and market analysis..	Apply
CO3: Apply design thinking to develop, prototype, and validate innovative engineering solutions in capstone projects for real-world applications.	Apply

Text Book(s):

T1. Sabell Osann, Lena Mayer , Inga Wiele ,The Design Thinking Quick Start Guide: A 6-Step Process

for Generating and Implementing Creative Solutions, Wiley, 2020.

T2. Christian Müller-Roterberg, Handbook of Design Thinking, Kindle Direct Publishing,2018.

Reference Book(s):

R1. Teun den Dekker, Design Thinking, Taylor & Francis, International edition, 2020.

R2. Kaushik Kumar, Divya Zindani, J.Paulo Davim, Design Thinking to Digital Thinking, Springer, 2019.

R3.S. Balaram, Thinking Design, SAGE Publications, 2011.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	2			2	2	2	2	-	-	-

High-3; Medium-2; Low-1

Course Code: 23ITE043		Course Title: Integrated Big Data Solutions (Common to AD,AM,CS,IT & SC)	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objective

This course is intended to impart knowledge on distributed computing, NoSQL databases, and data warehousing for scalable data management, and to explore big data technologies for solving real-world problems.

Module I **22 Hours**

Distributed Computing: Introduction, Message Passing, Shared Memory, Consensus algorithms, Distributed Transactions, Mutual exclusions, dead locks, Local & Global time and state, Distributed file systems.

NoSQL: Introduction to NoSQL Databases, CAP Theorem, Type of NoSQL Databases, Key-Value Stores, Document Stores Column, Family Stores, Graph Databases.

Data Warehouse: Data Warehouse Basics, Data Warehouse Architecture, Modeling Facts, Modeling Dimensions, Schemas, Data Cleaning Techniques, ETL Process.

Module II **23 Hours**

Data Mining: Introduction, Data Mining Functionalities, Data Pre-processing, Data Cleaning, Data Integration and Transformation, Classification of Data Mining Systems.

Introduction to Big Data computing: Defining Big Data, 3 Vs, Challenges and Opportunities, Hadoop, Introduction to Apache Hadoop, Components of the Hadoop Ecosystem, Map Reduce Programming Model, HDFS: Architecture, HDFS Commands, Data Replication and Fault Tolerance.

Big Data Analytics Tools: Apache Spark, Spark's Role in Big Data Analytics, PySpark, Overview of PySpark, Data Processing with PySpark, Data Lakehouse Concepts Performance Considerations.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply distributed computing concepts to design and implement solutions for parallel and scalable systems.	Apply
CO2: Analyze various data storage and retrieval techniques in NoSQL databases to determine their effectiveness in high-performance application scenarios.	Analyze
CO3: Apply data warehousing concepts and data mining techniques to extract insights and inform decision-making in real-world scenarios.	Apply
CO4: Analyze the big data using Map-reduce programming in Both Hadoop and Spark framework.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	-	3	3	-	-	-	-	-	-	-	-	-
CO4	-	-	3		3	-	-	-	3	3	-	-	3	-

High-3; Medium-2; Low-1

Text Book(s):

T1. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed Systems”, 3rd Edition, Pearson Education, 2017. (Module I)

T2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013. (Module II)

Reference Book(s):

R1. Jiawei Han, Micheline Kamber and Jian Pei, “Data mining concepts and Techniques”,3rd Edition, Elsevier, 2012.

R2. Tom White, “Hadoop: The Definitive Guide”, O"Reilly Publication and Yahoo! Press, 4th Edition, 2015.

R3. George Coulouris, Jean Dollimore, and Tim Kindberg, “Distributed Systems Concepts and Design”, 5th Edition, Pearson Education, 2017.

R4. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

Web References:

1.https://onlinecourses.nptel.ac.in/noc20_cs92/

2.https://hadoop.apache.org

3. https://www.ibm.com/cloud/learn/nosql-databases

Course Code: 23ITE044		**Course Title: AWS Services with Devops Tools (Common to AD,AM,CS,IT & SC)**	
Course Category: Major		**Course Level: Higher**	
L:T:P(Hours/Week) 2: 0: 2	**Credits: 3**	**Total Contact Hours: 60**	**Max Marks: 100**

Course Objectives

This course is intended to equip students with practical skills in managing and deploying cloud infrastructure using AWS services and DevOps tools, focusing on automation with PowerShell scripting and monitoring cloud environments using Grafana for efficient and scalable operations.

Module I **15 Hours**

AWS Introduction - Identity and Governance - AWS Administration - Network Connectivity - AWS Storage S3- EC2- Auto Scaling -Load Balancing -VPC -RDS - Route53 -Containers and Serverless Computing – Monitoring - Introduction to DevOps – GIT – Ansible – Jenkins – Dockers – Terraform – Maven

Module II **15 Hours**

PowerShell Introduction-Data Structures-Objects-Conditional-Loops-Functions and Pipelines- Script Execution-Error Handling-Input / Output - Text Processing – SMTP Notification and Regular Expressions-Configuration using XML- Grafana Architecture - Grafana Dashboard Basics- PromQL Command.

List of Experiments: (6 Experiments) **30 hours**

1. Design a web application in EC2 & Elastic Beanstalk
2. Create Cloud Monitoring and Management Service using AWS CloudWatch
3. Install Git and check-in code into Repository
4. Build Infrastructure for EC2 instance and S3 using Terraform
5. Deploy Django app & its Content Management Systems in Cloud
6. Create an automated CI/CD pipeline in Jenkins using declarative pipelines using powershell.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Implement core AWS services for scalable application deployment and management.	Apply
CO2: Automate infrastructure provisioning, configuration, and continuous integration/delivery pipelines using Devops tools.	Apply
CO3: Apply PowerShell scripting fundamentals to automate system administration and configuration tasks.	Apply
CO4: Create monitoring dashboards and write queries for effective visualization and analysis of cloud infrastructure metrics.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	3	-	3	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Reference Book(s):

R1. Mark Wilkins, “Learning Amazon Web Services (AWS) A Hands-On Guide to the Fundamentals of AWS Cloud”, Pearson Education, Inc, 2020.

R2. Raoul Alongi, “AWS: The Most Complete Guide to Amazon Web Services from Beginner to Advanced Level”, published by MCP, 2020.

R3. Theo H King, “Aws: The Ultimate Guide from Beginners to Advanced for The Amazon Web Services”, 2020.

R4. Lee Holmes, “PowerShell Cookbook: Your Complete Guide to Scripting the Ubiquitous Object-Based Shell”, 4th Edition, Shroff/O'Reilly,2021.

R5. Gene Kim, Jez Humble, Patrick Debois, John Willis and Nicole Forsgren “The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations”, 2nd Edition, Shroff/IT Revolution,2024.

Web References:

1. https://aws.amazon.com/free/?

2. https://git-scm.com/docs/git#_git_commands

3. https://www.pdq.com/powershell/

Course Code: 23ITE047		Course Title: Intellectual Property Rights (Common to all B.E/B.Tech Programmes)	
Course Category: Minor		Course Level: Higher	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives

The course is intended to learn the fundamental concepts of Intellectual Property Law, including patent classifications, trademark strategies, and copyright protections.

Module I **22 Hours**

Intellectual Property: An Introduction: Intellectual Property Law: Patent Law-Copyright Law-Trademark Law- Trade secret Law-Right of Publicity-Paralegal tasks in Intellectual Property Law-Ethical obligations of the paralegal in Intellectual Property Law-Trade secrets: Protectible as a trade secret-Maintaining trade secrets-Protecting an Idea.

Patents: Rights and Limitations: Sources of patent law-Subject matter of Patents: Utility Patents-Plant Patents-Design Patents-Design Patents and copyright-Design Patents and trademarks-Computer Software, Business methods and Patent Protection-Rights under Patent Law-Patent Requirements-Limitations on Patent Rights-Patent Ownership.

Module II **23 Hours**

Patents: Research, Applications, Disputes, and International Considerations: Patent Search Process-Patent Application Process-Patent Infringement-Patent Litigation, International Patent laws.

Principles of Trademark: Trademarks and Unfair Competition-Acquiring Trademark Rights-Types of Marks, Strong Marks Versus Weak Marks-Selecting and Evaluating a Trademark-International Trademark Laws.

Principles of Copyrights: Sources of Copyright Law- The Eight Categories of Works of Authorship-Derivative Works and Compilations- Rights and Limitations: Grant of Exclusive Rights–Copyrights Ownership- International Copyright Laws.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply the fundamental concepts of Intellectual Property Law to real-world scenarios.	Apply
CO2: Demonstrate an understanding of the Rights and Limitations of various patents through practical examples.	Apply
CO3: Analyze the process of patent searching and application filing to assess its effectiveness in protecting intellectual property.	Analyze
CO4: Examine the principles of trademark and copyright to differentiate their roles and implications in intellectual property law.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	2	-	-	-	-	2	-	-	2	-
CO4	-	2	-	-	3	-	-	3	2	-	-	-	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. Richard Stim, “Intellectual Property: Copyrights, Trademark and Patents”, Cengage learning, 2nd edition 2012.

Reference Book(s):

R1. Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets”, Cengage Learning, 3rd Edition, 2013.

R2. Prabuddha Ganguli,”Intellectual Property Rights: Unleashing the Knowledge Economy”, McGraw Hill Education, 2017.

R3. David Llewelyn, Tanya Frances Aplin, “Intellectual Property Patents ,Copyrights , Trademarks & Allied Rights”, Sweet & Maxwell, 2023.

R4. William F. Patry ,"Principles of Intellectual Property: Patents, Trademarks, and Copyrights", Wolters Kluwer, 2023.

Web References:

1. https://ipindia.gov.in/writereaddata/Portal/ev/sectionsindex.html

Course Code:23MEE008		Course Title: PLM for Engineers (Common to all Programmes)	
Course Category: Minor		Course Level: Higher	
L:T:P (Hours/Week): 2: 0: 2	Credits: 3	Total Contact Hours: 60	Max Marks:100

Course Objectives:

The course is intended to apply Product Lifecycle Management (PLM) fundamentals and principles to develop strategies, manage product lifecycles, optimize engineering processes, configure Bills of Materials, and leverage digital manufacturing environments for practical applications and customer-centric use cases.

Module I **22 Hours**

Business Strategy in the PLM

Definition, PLM Lifecycle Model, Threads of PLM, Need for PLM, Opportunities and Benefits of PLM, Components and Phases of PLM, PLM feasibility Study, PLM Visioning, Strategy, Impact of strategy, Implementing a PLM strategy, PLM Initiatives to Support Corporate Objectives, Infrastructure Assessment.

Business Processes in the PLM and Product Development Concepts

Characteristics of PLM, Environment Driving PLM, PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM. Engineering Vaulting, Product Reuse, Smart Parts, Engineering Change Management, Workflow Management.

Bill of Materials (E-BOM, M-BOM, S-BOM) and Process Consistency, Product Structure, Configuring BOM

Module II **23 Hours**

Digital Mock Up and Validation

Simulation Process Management, Variant Management, Digital Mock-Up and Prototype Development, Design for Environment, Virtual Testing and Validation, Marketing Collateral

Digital Manufacturing in the PLM

Digital Manufacturing, Benefits of Digital Manufacturing, Manufacturing the First-One, Ramp Up, Virtual Learning Curve, Manufacturing the Rest, Production Planning.

Customer Use Cases of the PLM

Impact and Challenges faced while implementing a successful PLM strategy -Rolls Royce, Nissan Motor, Sunseeker International , Xtrac ,kesslers international and monier and weatherford international.

List of Exercises: **15 Hours**

1. Demonstrate the 2-Tier & 4-Tier Architectures and Basic Team center applications like Organization, Project, and Schedule Manager.
2. Create CAD and Non-CAD datasets (MS Office, Notepad, etc.) by using explicit and implicit Check-In and Check-Out to create multiple iterations
3. Create the access control (Read, Write, and Delete) for the given dataset and block the access rights to other group members belongs to the same department. Also Perform the Impact Analysis (Where Used and Where Referenced) of a given dataset which is used in multiple assemblies.
4. Create the Product Structure in Structure Manager with 5 components assembled in first

   level and 3 components Assembled in second, third and fourth level with the sub-assemblies and export the assembly in local drive. Also, demonstrate the Variant Management.
5. Export the CAD dataset as a JT file and perform the various visualization tasks like Measurements, Sectioning, PMI, and Mark-up using JT2GO application

Text Book(s):

T1. John Stark, “Product Lifecycle Management: Volume 1: 21st Century Paradigm for Product Realisation”, Springer International Publishing Switzerland, 4th Edition, 2020.

T2. Grieves Michael, “Product Lifecycle Management- Driving the Next Generation of Lean Thinking”, McGraw-Hill, 2010.

T3. Wang, Lihui; Nee, Andrew Y.C. (Eds.) Collaborative Design and Planning for Digital Manufacturing, Springer, 2009.

. **Reference(s):**

R1. Elangovan, U., “Product Lifecycle Management (PLM)”. Boca Raton, CRC Press, 2020.

R2. Fabio Giudice, Guido La Rosa, Product Design for the environment-A life cycle approach, Taylor & Francis 2006.

R3. Antti Saaksvuori, “ Product Life Cycle Management” - Anselmi Immonen, Springer, 3rd Edition, 2008.

Course Outcomes	Cognitive Level
At the end of the course students will able to	
CO1: Apply the fundamentals of PLM principles to develop a PLM strategy for a system.	Apply
CO2: Apply PLM principles to manage product lifecycles, optimize engineering processes, and configure Bill of Materials with consistent workflows	Apply
CO3: Apply the Digital Manufacturing environment using PLM for use cases.	Apply
CO4: Develop and present a report individually by applying various modules of PLM software for an engineering project.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	-	-	-	-	-	-	-	-		
CO2	3	-	-	-	-	-	-	-	-	-	1	-		
CO3	3	-	-	-	-	-	-	-	-	-	-	-		
CO4	-	-	3	-	-	-	-	-	1	1	-	-		

High-3; Medium-2; Low-1