MOHAN BABU UNIVERSITY

Sree Sainath Nagar, Tirupati – 517 102

MBU
MOHAN BABU
UNIVERSITY
DREAM. BELIEVE. ACHIEVE

SCHOOL OF COMPUTING

B.Tech. Computer Science and Engineering (Cloud Computing)

CURRICULUM AND SYLLABUS

(From 2025-26 Admitted Batches)

FULLY FLEXIBLE CHOICE BASED CREDIT SYSTEM (FFCBCS)

MOHAN BABU UNIVERSITY

Vision

To be a globally respected institution with an innovative and entrepreneurial culture that offers transformative education to advance sustainability and societal good.

Mission

- Develop industry-focused professionals with a global perspective.
- Offer academic programs that provide transformative learning experience founded on the spirit of curiosity, innovation, and integrity.
- Create confluence of research, innovation, and ideation to bring about sustainable and socially relevant enterprises.
- Uphold high standards of professional ethics leading to harmonious relationship with environment and society.

SCHOOL OF COMPUTING

Vision

To lead the advancement of computer science research and education that has real-world impact and to push the frontiers of innovation in the field.

Mission

- Instil within our students fundamental computing knowledge, a broad set of skills, and an inquisitive attitude to create innovative solutions to serve industry and community.
- Provide an experience par excellence with our state-of-the-art research, innovation, and incubation ecosystem to realise our learners' fullest potential.
- Impart continued education and research support to working professionals in the computing domain to enhance their expertise in the cutting-edge technologies.

- Inculcate among the computing engineers of tomorrow with a spirit to solve societal challenges.

DEPARTMENT OF DATA SCIENCE

Vision

To become a nationally recognized quality education center in the domain of Computer Science and Cloud Computing through teaching, training, learning, research and consultancy.

Mission

- The Department strives to produce high quality information technologists and Cloud Computing Professionals by disseminating knowledge through contemporary curriculum, competent faculty and adopting effective teaching-learning methodologies.
- Igniting passion among students for research and innovation by exposing them to real time systems and problems
- Developing technical and life skills in diverse community of students with modern training methods to solve problems in Software Industry.
- Inculcating values to practice engineering in adherence to code of ethics in multicultural and multi discipline teams.

B.Tech. Computer Science and Engineering (Cloud Computing)

PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of B.Tech.CSE (Cloud Computing) will:

PEO1. Pursue higher education in reputed institutions in the field of Computer Science, Cloud Computing, or management.

PEO2. Accomplish successful professional careers in IT-enabled industries with skills in designing, deploying, managing, and optimizing cloud-based solutions and infrastructure.

PEO3. Evolve as entrepreneurs by acquiring required skills to solve real-world problems in the cloud computing domain and to develop innovative, scalable, and secure cloud-native applications and services.

PEO4. Develop innovative engineering tools and techniques using research and complex problem-solving skills through life-long learning and exhibit high ethical attitudes in professional practice within the cloud computing industry.

PROGRAM OUTCOMES

On successful completion of the Program, the graduates of B.Tech. CSE (Cloud Computing) Program 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 modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge andunderstanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

On successful completion of the Program, the graduates of B. Tech. CSE (Cloud Computing) program will be able to:

PS01. Design, implement, and evaluate scalable and secure cloud computing systems, identifying, preventing, and protecting them from vulnerabilities and service disruptions.

PS02. Develop innovative cloud solutions using Computer Science principles modern cloud tools, and platform-specific techniques to address complex societal and industry issues.

PS03. Apply cloud database tools and techniques to efficiently store, process, retrieve, and analyze large-scale data, enabling data-driven insights and applications in the cloud.

PS04. Design and develop algorithms, applications, and services leveraging modern cloud platforms, technologies, and deployment models to solve real-time problems in distributed environments.

B.Tech. Computer Science and Engineering (Cloud Computing)

Basket Wise - Credit Distribution

(Regular – 4 Years Program)

S. No.	Basket	Credits (Min.- Max.)
1	SCHOOL CORE	50-56
2	PROGRAM CORE	45-61
3	PROGRAM ELECTIVE	12-18
4	SPECIALIZATION ELECTIVE	24-36
5	UNIVERSITY ELECTIVE	9-15
	TOTAL CREDITS	**Min. 160**

Basket Wise - Credit Distribution

(Lateral Entry – 3 Years Program)

S. No.	Basket	Credits (Min.- Max.)
1	SCHOOL CORE	20-36
2	PROGRAM CORE	45-61
3	PROGRAM ELECTIVE	12-18
4	SPECIALIZATION ELECTIVE	24-36
5	UNIVERSITY ELECTIVE	9-15
	TOTAL CREDITS	**Min. 120**

School Core (50-56 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite/anti-requisite
		L	T	P	S	C	
22MM102453	Physics for Computing	3	-	2	-	4	-
22EE102401	Basic Electrical and Electronics Engineering	3	-	2	-	4	-
22CS102001	Programming for Problem Solving	3	-	2	-	4	Logic Building Using C (anti-requisite)
22CS102031	Logic Building Using C	3	-	2	-	4	Programming for Problem Solving(anti-requisite)
22AI105001	Design Thinking	-	1	2	-	2	-
22CB111001	Internship	-	-	-	-	2	-
22CB108001	Capstone Project	-	-	-	-	10	-
Language Basket (Min. 3 Credits to be earned)							
22LG111001	English Language Proficiency	-	-	-	0	2	
22LG102401	English for Professionals	2	-	2	-	3	
22LG105402	Soft Skills	-	-	2	-	1	
22LG101403	German Language	2	-	-	-	2	
22LG101404	French Language	2	-	-	-	2	
22LG102402	Empowering Your English	2	-	2	-	3	
Mathematics Basket (Min. 12 Credits to be earned)							
22MM101403	Calculus and Transformation Techniques	3	-	-	-	3	-
22MM101401	Matrix Theory and Linear Algebra	3	-	-	-	3	-
22MM101405	Numerical Methods, Probability and Statistics	3	-	-	-	3	-
22MM101407	Number Theory and Algebra	3	-	-	-	3	-
22MM101408	Statistics for Engineers	3	-	-	-	3	Numerical Methods, Probability and Statistics
22MM102403	Calculus and Transformation Techniques	3	-	2	-	4	-

Introduction to Computer Science (Min. 2 Credits to be earned)							
22AI105002	Disruptive Technologies	-	1	2	-	2	-
22AI105003	Free and Open Source Software	-	1	2	-	2	-

Course Code	**Title of the Course**	**Lecture**	**Tutorial**	**Practical**	**Project based Learning**	**Credits**	**Pre-requisite/anti-requisite**
		L	**T**	**P**	**S**	**C**	
22CB105001	Computer Hardware and System Essentials	-	1	2	-	2	-
Programming Languages (Min. 5 Credits to be earned)							
22AI104001	Object Oriented Programming through C++	3	-	2	4	5	Programming Essentials Using C++ (anti-requisite)
22CS105002	Programming Essentials Using C++	_	1	2	_	2	Object Oriented Programming through C++(anti-requisite)
22AI104002	Object Oriented Programming through Java	3	-	2	4	5	Problem Solving Through Java(anti-requisite)
22CS102032	Problem Solving Through Java	3	_	2	_	4	Object Oriented Programming through Java(anti-requisite)
Management Basket (Min. 3 Credits to be earned)							
22CM101401	Principles of Business Economics and Accountancy	3	-	-	-	3	-
22MG101401	Essentials of Leadership	2	-	-	-	2	-
22MG101402	Organizational Behaviour	2	-	-	-	2	-
22MG101403	Project Management	2	-	-	-	2	-
Mandatory Courses (Min. 8 Credits to be earned - Earned Credits will not be considered for CGPA)							
22LG107601	Professional Ethics and Human Values	2	-	-	-	2	-
22CE107601	Environmental Science*	2	-	-	-	2	-
22CE107602	Disaster Mitigation and Management	2	-	-	-	2	-
22CE107603	Rural Technology	2	-	-	-	2	-
22LG107603	Spoken English	-	1	2	-	2	English for Professionals

22LG107602	Essential Life Skills for Holistic Development	2	-	-	-	2	-
22AB107601	NSS Activities	-	-	-	-	2	-
22AB107602	Yoga	2	-	-	-	2	-
22AB107603	NCC Activities	-	-	-	-	2	
22MG107401	Innovation, Incubation and Entrepreneurship	2	-	-	-	2	-
22EE107001	Intellectual Property Rights	2	-	-	-	2	-
22EE107002	Fundamentals of Research Methodology						

*Compulsory Course

School Core (20-36 Credits) - (Lateral Entry – 3 Years Program)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite/anti-requisite
		L	T	P	S	C	
22MM102453	Physics for Computing	3	-	2	-	4	-
22LG111001	English Language Proficiency	-	-	-	0	2	
22EE102401	Basic Electrical and Electronics Engineering	3	-	2	-	4	-
22CS102001	Programming for Problem Solving	3	-	2	-	4	Logic Building Using C (anti-requisite)
22CS102031	Logic Building Using C	3	-	2	-	4	Programming for Problem Solving(anti-requisite)
22AI105001	Design Thinking	-	1	2	-	2	-
22CS111001	Internship	-	-	-	-	2	-
22CS108001	Capstone Project	-	-	-	-	10	-
22LG102401	English for Professionals	2	-	2	-	3	-
22LG105402	Soft Skills	-	-	2	-	1	-
22LG101403	German Language	2	-	-	-	2	-
22LG101404	French Language	2	-	-	-	2	-
22MM101403	Calculus and Transformation Techniques	3	-	-	-	3	-
22MM101401	Matrix Theory and Linear Algebra	3	-	-	-	3	-
22MM101405	Numerical Methods, Probability and Statistics	3	-	-	-	3	-
22MM101407	Number Theory and Algebra	3	-	-	-	3	-
22MM101408	Statistics for Engineers	3	-	-	-	3	-
22AI105002	Disruptive Technologies	-	1	2	-	2	-
22AI105003	Free and Open Source Software	-	1	2	-	2	-

22CB105001	Computer Hardware and System Essentials	-	1	2	-	2	-
22AI104001	Object Oriented Programming through C++	3	-	2	4	5	Programming Essentials using C++(anti-requisite)
22CS105002	Programming Essentials Using C++	-	1	2	-	2	Object Oriented Programming through C++(anti-requisite)
22AI104002	Object Oriented Programming through Java	3	-	2	4	5	Problem Solving Through Java(anti-requisite)
22CS102032	Problem Solving Through Java	3	_	2	_	4	Object Oriented Programming through Java(anti-requisite)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite/anti-requisite
22AI104002	Object Oriented Programming through Java	3	-	2	4	5	-
22CM101401	Principles of Business Economics and Accountancy	3	-	-	-	3	-
22MG101401	Essentials of Leadership	2	-	-	-	2	-
22MG101402	Organizational Behaviour	2	-	-	-	2	-
22MG101403	Project Management	2	-	-	-	2	-
Mandatory Courses (Min. 6 Credits to be earned - Earned Credits will not be considered for CGPA)							
22LG107601	Professional Ethics and Human Values	2	-	-	-	2	-
22CE107601	Environmental Science*	2	-	-	-	2	-
22CE107602	Disaster Mitigation and Management	2	-	-	-	2	-
22CE107603	Rural Technology	2	-	-	-	2	-
22LG107603	Spoken English	-	1	2	-	2	-
22LG107651	STEP	-	-	-	-	2	
22LG107602	Essential Life Skills for Holistic Development	2	-	-	-	2	-
22AB107601	NSS Activities	-	-	-	-	2	-

22AB107602	Yoga	-	-	-	-	2	-
22AB107603	NCC Activities	-	-	-	-	2	-
22MG107401	Innovation, Incubation and Entrepreneurship	2	-	-	-	2	-
22EE107001	Intellectual Property Rights	2	-	-	-	2	-
22EE107002	Fundamentals of Research Methodology	2	-	-	-	2	-

* **Compulsory Course**

Program Core (45-61 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite/anti-requisite
		L	T	P	S	C	
22AI101001	Discrete Mathematical Structures	3	-	-	-	3	-
22AI101002	Theory of Computation	3	-	-	-	3	-
22IT101001	Software Engineering	3	-	-	-	3	-
22CS101001	Digital Logic Design	3	-	-	-	3	-
22CS101002	Computer Organization and Architecture	3	-	-	-	3	Digital Logic Design
22AI102001	Operating Systems	3	-	2	-	4	
22CB102001	Cryptography and Network Security	3	-	2	-	4	Computer Networks
22CB101001	Cyber Security Essentials	3	-	-	-	3	-
22CB102002	Computer Networks	3	-	2	-	4	-
22CB102003	Security Threats and Modeling	3	-	2	-	4	Cryptography and Network Security
22CB102004	Malware Analysis and Penetration Testing	3	-	2	-	4	Computer Networks
22CB102005	Ethical Hacking	3	-	2	-	4	Computer Networks
22CS102002	Python Programming	3	-	2	-	4	Problem Solving Through Python (anti-requisite)
22CS102034	Problem Solving Through Python	**3**	_	**2**	_	**4**	Python Programming(anti-requisite)
22CS102003	Data Structures	3	-	2	-	4	Industry Data Structures and Algorithms(anti-requisite)
22CS102033	Industry Data Structures and Algorithms	3	_	2	_	4	Data Structures(anti-requisite)
22CS102035	Competitive Programming	3	_	2	_	4	
22CS102004	Design and Analysis of Algorithms	3	-	2	-	4	-
22CS102005	Database Management Systems	3	-	2	-	4	-
22CS102006	Compiler Design	3	-	2	-	4	Theory of Computation
22IT104001	Web Technologies	3	-	2	4	5	Object Oriented Programming through JAVA

Program Elective (12-18Credits)

Course Code	Knowledge Area	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
			L	T	P	S	C	
22CS101005	Computing	Distributed Systems	3	-	-	-	3	-
22CS101006		High Performance Computing	3	-	-	-	3	-
22DS101013		Generative AI	3	-	-	-	3	Python Programming
22DS101014		Expandable AI	3	-	-	-	3	Machine Learning
22IT102003	Networks	Cloud Computing	3	-	2	-	4	-
22CB101002		Mobile Computing	3	-	-	-	3	Computer Networks
22CB102006		Internet of Things	3	-	2	-	4	Computer Networks
22CS101011		Ad-hoc and Wireless Sensor Networks	3	-	-	-	3	Computer Networks
22CB101018		Semantic Web and Social Networks	3	-	-	-	3	Computer Networks, Web Technologies
22CB101021		5G Technologies	3	-	-	-	3	Computer Networks
22AI101017	Information Management	Data Mining	3	-	-	-	3	Database Management Systems
22CB101019		Mobile Databases	3	-	-	-	3	Computer Networks and Database Management Systems
22DS102002		Big Data Technologies	3	-	2	-	4	Database Management Systems
22CB101020		Digital and Social Media Marketing	3	-	-	-	3	Computer Networks
22AI102003		Machine Learning	3	-	2	-	4	
22CS102008	Programming Languages	Advanced Java programming	3	-	2	-	4	Object Oriented Programming through Java
22CS105001		R Programming	-	1	2	-	2	-
22CB102007		Network Programming	3	-	2	-	4	Computer Networks
22CS102007		Linux Programming	3	-	2	-	4	Programming for Problem Solving
22CS104001	Platform Based Development	MERN Stack Development	3	-	2	4	5	Web Technologies
22CS104002		Mobile Application Development	3	-	2	4	5	Object Oriented Programming through Java

Specialization Elective (24-36 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22CC102001	Cloud Computing (AWS Cloud/Azure/Google Cloud)	3		2		4	
22CC102002	Cloud Data Analytics	3	-	2	-	4	
22CC101001	Cloud Computing Tools & Techniques	3	-	-	-	3	
22CC101002	Cloud Deployment	3	-	-	-	3	
22CC102003	Distributed Systems and Cloud Databases	3	-	2	-	4	Database Management Systems
22CC101003	Cloud Infra & DevOps	3	-	-	-	3	
22CC102004	Cloud-Based Machine Learning	3	-	2	-	4	Machine Learning
22CC101004	Cloud Service Models	3	-	-	-	3	
22CC101005	Cloud Administration	3	-	-	-	3	Computer Networks
22CC101006	Cloud Security and Analytics	3	-	-	-	3	
22CC101007	Cloud Networking	3	-	-	-	3	
22CC101008	Cloud and Business Process Management	3	-	-	-	3	
22CC101009	Wireless and Mobile Security	3	-	-	-	3	Mobile Computing
22CC101010	Internet of Things and Cloud Integration	3	-	-	-	3	Internet of Things
22CC101011	Private Cloud Deployment and Management	3	-	-	-	3	Virtualization Techniques
22CC101012	Cloud Security Models and Implementation in Azure	3	-	-	-	3	
22CC101013	Cloud Automation	3	-	-	-	3	Cloud Fundamentals
22CC101014	Parallel and Distributed Computing	3	-	-	-	3	Distributed Systems
22CC101014	Multi Cloud and Generative AI	3	-	-	-	3	
22CC101015	Cloud Application Development	3	-	-	-	3	
22CC101016	Cloud Strategy and Management	3	-	-	-	3	
22CC101017	Cloud Computing and Virtualization	3	-	-	-	3	

University Elective (9-12 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22EC101701	AI in Healthcare	3	-	-	-	3	-
22CM101701	Banking and Insurance	3	-	-	-	3	-
22DS101701	Bioinformatics	3	-	-	-	3	-
22BS101701	Biology for Engineers	3	-	-	-	3	-
22LG101701	Business Communication and Career Skills	3	-	-	-	3	-
22CE101701	Civil Engineering and The Society	3	-	-	-	3	-
22SS101701	Constitution of India	3	-	-	-	3	-
22CM101702	Cost Accounting and Financial Management	3	-	-	-	3	-
22CB101701	Cyber Laws and Security	3	-	-	-	3	-
22EE101701	Electrical Safety and Safety Management	3	-	-	-	3	-
22MG101701	Entrepreneurship for Micro, Small and Medium Enterprises	3	-	-	-	3	-
22CE101702	Environmental Pollution and Control	3	-	-	-	3	-
22EC101702	Essentials of VLSI	3	-	-	-	3	-
22CB101702	Introduction to Ethical Hacking	3	-	-	-	3	-
22CB101703	Forensic Science	3	-	-	-	3	-
22SS101702	Gender and Environment	3	-	-	-	3	-
22ME101701	Global Strategy and Technology	3	-	-	-	3	-
22EE101704	Green Technologies	3	-	-	-	3	-
22ME101702	Human Resource Management	3	-	-	-	3	-
22SS101703	Indian Economy	3	-	-	-	3	-
22SS101704	Indian History	3	-	-	-	3	-
22SS101705	Indian Tradition and Culture	3	-	-	-	3	-
22EC101703	Instrumentation in Industries	3	-	-	-	3	-

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22EC101704	Introduction to Nanotechnology	3	-	-	-	3	-
22AI101701	Introduction to Artificial Intelligence	3	-	-	-	3	-
22DS101702	Introduction to Data Science	3	-	-	-	3	-
22AI101702	Introduction to Machine Learning	3	-	-	-	3	-
22CS101701	Introduction to Python Programming	3	-	-	-	3	-
22CB101704	Introduction to Internet of Things	3	-	-	-	3	-
22LG101703	Logical Reasoning and Recruitment Essentials	3	-	-	-	3	-
22ME101703	Management Science	3	-	-	-	3	-
22ME101704	Managing Innovation and Entrepreneurship	3	-	-	-	3	-
22ME101705	Material Science	3	-	-	-	3	-
22LG101702	Personality Development	3	-	-	-	3	-
22CE101703	Planning for Sustainable Development	3	-	-	-	3	-
22EC101705	Principles of Communication Engineering	3	-	-	-	3	-
22LG101702	Quantitative Aptitude and Verbal Ability	3	-	-	-	3	-
22EE101702	Reliability and Safety Engineering	3	-	-	-	3	-
22CE101704	Remote Sensing, GIS and GPS	3	-	-	-	3	-
22CE101705	Smart Cities	3	-	-	-	3	-
22EC101706	Smart Sensors for Engineering Applications	3	-	-	-	3	-
22LG101703	Stress Management and Well Being	3	-	-	-	3	-
22EE101703	Sustainable Energy Systems	3	-	-	-	3	-
22CS101702	Web Design Fundamentals	3	-	-	-	3	-
22SS101706	Women Empowerment	3	-	-	-	3	-

Note:

1. If any student has chosen a course or equivalent course from the above list in their regular curriculum then, he/she is not eligible to opt the same course/s under University Elective.
2. The student can choose courses from other disciplines offered across the schools of MBU satisfying the pre-requisite other than the above list.

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MM102453	**PHYSICS FOR COMPUTING**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on wave optics, Quantum mechanics and its applications, Semiconductor diodes, optoelectronic devices, and Fiber optics.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the concepts of light waves to interpret the concepts of Interference, Diffraction, and Polarization.

CO2. Demonstrate the basic knowledge of the quantum behaviour of matter in its microstate.

CO3. Analyze the band structure of solid materials using quantum physics.

CO4. Understand the basic concepts of semiconductors in the functioning of various optoelectronic devices.

CO5. Demonstrate the concepts of electromagnetic wave propagation in optical fibers.

CO6. Work independently and in teams to solve problems with effective communications.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	1	-	-	-	-	-
CO2	3	2	-	1	-	-	-	-	-	-	-	-
CO3	3	2	-	1	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	1	-	-	-	-	-	-
CO5	3	2	-	-	1	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	1	1	1	-	-
Course Correlation Mapping	3	2	1	1	1	1	1	1	1	1	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: WAVE OPTICS ***(10 Periods)***

Interference: Introduction - Interference in thin films (reflected light) - Newton's rings - Determination of wavelength.

Diffraction: Introduction - Fraunhofer diffraction - Single slit diffraction (qualitative) - Double slit diffraction (qualitative).

Polarization: Introduction - Polarization by reflection - and double refraction - Nicol's prism - Half wave and Quarter wave plate - Engineering applications of interference - diffraction and polarization.

Module 2: INTRODUCTION TO QUANTUM MECHANICS ***(08 Periods)***

***Principles of Quantum Mechanics*:** Introduction – de Broglie's hypothesis for matter waves - Davison and Germer's experiment - Schrödinger's one dimensional wave equation (time independent) - significance of wave function – Fermi Dirac distribution and effect of temperature (qualitative treatment).

Module 3: QUANTUM PHYSICS AND BAND THEORY OF SOLIDS: ***(08 Periods)***

Applications of Quantum Physics: Particle in a 1 D box (Eigen Value and Eigen Function) – 3 D Analysis (Qualitative) - Tunnelling Effect (Qualitative) - Kronig Penney model (qualitative treatment) - origin of energy bands formation in solids.

Module 4: SEMICONDUCTORS AND OPTOELECTRONIC DEVICES ***(11 Periods)***

Introduction - Intrinsic semiconductors - Density of electrons in intrinsic semiconductor - Intrinsic carrier concentration - Fermi energy - Electrical conductivity of intrinsic semiconductors - Extrinsic semiconductors - Density of charge carriers in Extrinsic semiconductors (qualitative) - Drift and Diffusion currents - Direct and Indirect band gap semiconductors - Hall effect - pn junction

Optoelectronic devices: Light Emitting Diode (LED) - Photodiode - Semiconductor diode laser

Module 5: FIBER OPTICS ***(08 Periods)***

Introduction to fiber optics - Total Internal Reflection - Critical angle of propagation - Acceptance angle - Numerical Aperture – V number (qualitative) - Classification of fibers based on Refractive index profile, modes - Applications of optical fibers – Fiber optic Sensors (temperature, displacement).

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS: (Minimum 10 experiments shall be conducted)

1 Estimation of the wavelength of the given laser by using a diffraction grating.

2. Predict the particle size using LASER by using the diffraction phenomenon.
3. Determine the thickness of thin wire using the wedge shape method.
4. Determination of the radius of curvature of the lens/wavelength of monochromatic source by using Newton's ring method
5. Find the numerical aperture of a given optical fiber and hence estimate its acceptance angle.
6. Calculate the number of charge carriers and Hall coefficients of a given semiconductor using the Hall Effect.
7. Find the forward and reverse resistance of a given p-n junction diode from its I-V characteristics curves.
8. Predict the energy gap of a semiconductor by varying the temperatures.
9. Estimation of threshold voltages of different LEDs.
10. Study the characteristics of Photodiode and determine its dark current.
11. Estimation of the magnetic field along the axis of a circular coil carrying current with Stewart Gee's method.
12. Determination of wavelength of light by plane diffraction grating using spectrometer by minimum deviation method.

RESOURCES

TEXTBOOKS:

1. M.N. Avadhanulu, P.G. Kshirsagar, and T.V.S Arun Murthy, *A Textbook of Engineering Physics*, S. Chand Publications, 11th edition, 2019.
2. R.K. Gaur and S.L. Gupta, *Engineering Physics*, Dhanpat Rai Publications (P) Ltd, 2015.
3. P.K. Palaniswamy,*Engineering Physics*, Scitech Publications India Private Limited, 2nd edition, 2009.
4. Serway and Jewett, *Physics for Scientists and Engineers with Modern Physics*, 6th Edition, Thomson Brooks, 2007.

REFERENCE BOOKS:

1. K. Thyagarajan, *Engineering Physics*, McGraw-Hill Education (India) Pvt. Ltd, 2016.
2. V. Rajendran*, Engineering Physics,* Tata McGraw Hill Publications Ltd, 7th Edition, New Delhi, 2014.
3. N.K. Verma, *Physics for Engineers,* PHI Pvt. Ltd., 2014.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/115102023
2. https://nptel.ac.in/courses/117102061
3. https://archive.nptel.ac.in/courses/122/107/122107035
4. https://nptel.ac.in/courses/115107095

Web Resources:

1. http://www.freepdfbook.com/engineering-physics-mcgraw-hill/
2. https://www.vedantu.com/revision-notes/cbse-class-12-physics-notes-chapter-10-wave-optics
3. https://salmanisaleh.files.wordpress.com/2019/02/physics-for-scientists-7th-ed.pdf
4. https://www.researchgate.net/publication/344758634_Short_Notes_on_Engineering_Physics

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22EE102401	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite Fundamentals of Electrical Technology.

Co-Requisite -

COURSE DESCRIPTION: This course is designed to provide an overview on the fundamentals of electrical and electrical engineering concepts and hands-on experience for non-electrical graduating students. The course address the fundamentals concepts of electrical circuits, operational aspects of motors, transformers and general electrical wiring systems. The course also emphasis on the illumination design, back-up supplies like UPS and Batteries, sensors and transducers, and principles of fundamental electronic devices and their applications.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the electrical circuits by applying the principles of electrical circuits.
CO2. Understand the operation of various motors used in domestic application, transformers and general wiring schemes.
CO3. Understand the operational aspects of UPS, batteries and design the appropriate lighting system for various industrial and domestic applications.
CO4. Understand the principle of various sensor and transducers to sense/measure various non-electrical parameters.
CO5. Understand the fundamentals of basic electronic devices, their characteristics and applications of electronic devices.
CO6. Work independently or in teams to solve problems with effective communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-	2	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	-	-	-	1	-	-	-	-	-	-	-	-	3	-
CO3	3	2	2	-	-	1	1	-	-	-	-	-	-	-	3	-
CO4	3	1	-	-	-	1	-	-	-	-	-	-	-	-	3	-
CO5	3	1	-	1	2	-	-	-	-	-	-	-	-	-	3	-
CO6	-	-	-	-	-	-	-	-	3	3	-	-	-	-	3	-
Course Correlation Mapping	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: FUNDAMENTALS OF ELECTRIC CIRCUITS (10 Periods)

Classification of network elements; Voltage-Current relations for passive elements; Kirchhoff's laws; Series-Parallel connection; Mesh and Nodal analysis (With DC Independent Sources only).

AC sources–Single loop generator, Phasor representation, Voltage, Current, Impedance, Power factor and Apparent power.

Module 2: ELECTRICAL SYSTEMS (09 Periods)

Motors: Types of motors, working principle and applications—DC motor, Three Phase Induction motor, Synchronous motor, Stepper motor.

Single Phase Transformer: Construction, principle of operation; EMF equation.

Electrical wiring: Methods of electrical wiring systems; Earthing procedure, Switch fuse unit (SFU), Operation of MCB and Relays.

Module 3: UTILIZATION OF ELECTRICAL SYSTEMS (09 Periods)

Illumination: Light sources, Terminologies, Laws of illumination; Types of lamps, Lighting calculations; Interior Lighting - Industrial lighting; Exterior lighting- Street lighting and Flood lighting.

Uninterruptible Power Supply (UPS) - Components in UPS, Functionality and Calculation of ratings for UPS components to a specific load.

Emergency supply: Batteries -Types of batteries, Elementary calculations for energy consumption for a specified application.

Module 4: SENSORS AND TRANSDUCERS (08 Periods)

Sensors- Light sensor, Voltage sensor, Temperature and Humidity sensor, Motion detection sensors, Wireless bluetooth sensors and Distance measurement with Ultrasound sensor.

Transducers -Basic requirements of transducers, Passive transducers - Strain gauge, Hall-Effect transducer, LVDT and Active transducers- Piezoelectric and Thermocouple, Data acquisition system (overview and concept only).

Module 5: FUNDAMENTALS OF ELECTRONICS ENGINEERING (09 Periods)

Half wave and full wave rectifier, Zener diode, characteristics, application – Regulator. BJT—operation; Introduction to Operational amplifier: Inverting and non-inverting amplifier. Application—Adder, Comparator, Integrator and Differentiator; Analog to Digital Convertors—Flash type and Successive approximation types; Digital to Analog converters—Weighed resistor and R-2R types.

Total Periods: *45*

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. Verification of Kirchhoff’s laws (Mesh and Nodal Analysis).
2. Performance evaluation by brake test on DC Shunt Motor.
3. Performance evaluation of a 1-Phase Transformer by Load test.
4. Practicing plate and pipe earthing system.
5. Operation and testing of Fuse, MCB and Relays.
6. Design and estimation of wiring for a typical house: One lamp controlled by one switch, Two lamp controlled by two switch and stair case wiring.
7. Calibration of LVDT for linear displacement measurement.
8. Analyze the characteristics of Resistance Temperature Detector (RTD) sensor.
9. Analyze the characteristics of piezoelectric sensor.
10. Investigate ripple factor and load regulations of rectifier with and without filters.

11. Design of inverting and non-inverting amplifiers using op-amp.
12. D-A converter (R-2R ladder) using Op-Amp 741 with required voltage levels.

TEXT BOOKS:

1. Ashfaq Hussain, Fundamentals of Electrical Engineering, Dhanpatrai& Co. (P) Ltd., 3rd Edition, New Delhi, 2009.
2. R. L. Boylestad and Louis Nashelsky, Electronics Devices and Circuits, PHI, 11th edition, 2009.

REFERENCE BOOKS:

1. Wadhwa, C. L. Basic Electric Engineering. 4th Edition, New Age International Private limited.
2. D. Patranabis, Sensors and Transducers, PHI Learning Private Limited, 2nd Edition, 2003.
3. A.K.Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co., 19th Edition, 2015.
4. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Private Limited, 2015.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/108108076
2. https://nptel.ac.in/courses/108105061
3. https://nptel.ac.in/courses/108108147
4. https://nptel.ac.in/courses/108101091

WEB RESOURCES:

1. https://www.electrical4u.com/electric-circuit-or-electrical-network/
2. https://www.electronicshub.org/dc-circuits-basics/
3. https://www.electrical4u.com/working-of-electric-motor/
4. https://electricalbaba.com/what-is-ups-working-types-of-ups-explained/
5. https://www.lrc.rpi.edu/resources/publications/pdf/illuminationfund.pdf
6. https://www.sitsitamarhi.ac.in/wp-content/uploads/2020/04/file_5e8ef00b06190.pdf
7. https://www.electronics-tutorials.ws/io/io_1.html
8. https://www.homemade-circuits.com/making-ups-tutorial/
9. https://www.engineersgarage.com/introduction-to-uninterruptible-power-supply-ups-and-its-design-part-1-17/
10. https://www.dfliq.net/blog/the-basics-of-electrical-components/

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CS102001	PROGRAMMING FOR PROBLEM SOLVING	3	-	2	-	4

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on C Programming concepts, Operators and Expressions, Input and Output Functions, Control Structures, Problem Solving Aspects, Arrays and Strings, Functions, Pointers, Structures and Unions, and File Handling.

COURSE OUTCOMES: *After successful completion of the course, students will be able to*:

CO1. Demonstrate knowledge on C programming constructs to develop programs.
CO2. Design algorithms using problem-solving techniques for given problems.
CO3. Apply functions and Arrays to enhance reusability and data manipulation.
CO4. Develop programs using pointers for efficient memory management.
CO5. Apply structures, unions and file handling concepts to develop societal applications.
CO6. Work independently or in team to solve problems with effective communications.

CO-PO-PSO Mapping Table:

Learning Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	3	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	3	2	3	-	-	-	-	-	-	-	-	-	3	-
CO3	3	2	3	-	3	-	-	-	-	-	-	-	-	-	3	-
CO4	3	2	3	-	3	-	-	-	-	-	-	-	-	-	3	-
CO5	3	3	3	2	3	3	-	-	-	-	-	-	-	-	3	-
CO6	-	-	-	-	-	-	-	-	3	3	-	-	-	-	3	-
Course Correlation Mapping	**3**	**2**	**3**	**2**	**3**	**3**	-	-	**3**	**3**	-	-	-	-	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO C PROGRAMMING ***(09 Periods)***

Basics of C Programming: Introduction, Structure of a C program, Concept of a variable, Data types in C, Program statement, Declaration, Storing the data in memory, Tokens, Operators and expressions, L values and R values, Type conversion in C.

Input and Output: Basic screen and keyboard I/O in C, Non-formatted input and output, formatted input and output functions.

Module 2: CONTROL STATEMENTS AND INTRODUCTION TO PROBLEM SOLVING ***(08 Periods)***

Control Statements: Specifying test condition for selection and iteration, Writing test expression, Conditional execution and selection, Iteration and repetitive execution, go to statement, Special control statements, Nested loops.

Introduction to Problem Solving: Algorithms, Flowcharts, Problem solving aspect, Top-down design, Implementation of algorithms, program verification and efficiency of algorithms.

Module 3: ARRAYS & STRINGS AND FUNCTIONS ***(10 Periods)***

Arrays and Strings: One-dimensional array – Declaration, Initialization, Accessing elements, operations; Multi-dimensional arrays – Declaration, Initialization, Working with 2D arrays; Strings – Declaration, Initialization, Printing strings, String input, Character manipulation, String manipulation; Arrays of strings – Initialization, manipulating string arrays.

Functions: Concept of function, Using functions, Call by value mechanism, working with functions, passing arrays to functions, Scope and extent, Storage classes, Recursion.

Module 4: POINTERS ***(08 Periods)***

Introduction to Pointers: Understanding memory addresses, Address operator (&), Pointer – declaration, Initialization, Indirection operator and dereferencing, Void and Null pointers, Use of pointers, Arrays and pointers, Pointers and strings, Pointer arithmetic, Pointers to pointers, Array of pointers, Pointers to an array, Two-dimensional arrays and pointers, Pointers to functions, Dynamic memory allocation.

Module 5: USER-DEFINED DATA TYPES AND FILES ***(10 Periods)***

User-Defined Data Types: Structures - Declaration, Accessing the members, Initialization, typedef and its use, Arrays of structures, Arrays within structure, Structures and pointers, Structures and functions; Unions, Enumeration types, Bit fields.

Files: Using files in C, Working with text and binary files, Direct File Input and Output, Files of records, Random access to files of records.

Total Periods: 45

EXPERIENTIAL LEARNING

1. a) Write a C program to perform the arithmetic operations on two integer numbers.
   b) Write a program to evaluate the following expressions by reading the necessary values from the keyboard.
      i. $(ax + b)/(ax - b)$ ii. $2.5 \log x + \text{Cos } 32^0 + | x^2 + y^2|$
      iii. $ax^5 + bx^3 + c$ iv. ae^{kt}
2. a) Write a C program to find the roots of a quadratic equation.
   b) In a town, the percentage of men is 52. The percentage of total literacy is 48 and the total percentage of literate men is 35 of the total population. Write a C program to find the total number of illiterate men and women if the population of the town is 7000.
3. a) Write a C Program to compute an electricity bill based on the following slab rates.

Consumption units	Rate (in Rupees/unit)
0-100	4.0
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8.0

   (***Hint***: Take current and old meter readings from the user to get consumption units)

   b) An insurance company computes the premium amount based on the following;
      i. If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city, and is a male then the premium is Rs.4 per thousand and the policy amount cannot exceed Rs.2 lakhs.
      ii. If a person satisfies all the above conditions and is female then the premium is Rs.3 per thousand and the policy amount cannot exceed Rs.1 lakh.
      iii. If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then premium is Rs.6 per thousand and the policy cannot exceed Rs. 10000.
      iv. In all other cases the person is not insured.

Write a C program to determine whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

c) Write a C Program to find the grade for a student using a Switch case. The user needs to enter a subject score (varies from 0 to 100)and then display the grade as described below.

Score	Grade	Score	Grade
> = 90	O	>=50 to< 60	D
>=80 to< 90	A	>=40 to< 50	E
>=70 to< 80	B	< 40	Fail
>=60 to< 70	C		

4. a) A Fibonacci sequence is defined as follows:
The first and second terms in the sequence are 0 and 1. Sub-sequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first *n* terms of the sequence.

b) Write a C program to find the sum of individual digits of a positive integer.

c) Write a C program to read two numbers *x* and *n*, and then compute the sum of the geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots+x^n$. Show appropriate error message for $n<0$. (*Example*: if *n* is 3 and *x* is 5, then the sum is: 1+5+25+125)

d) Write a C program to print the following pattern.

```
                1
            1   2   1
        1   2   3   2   1
    1   2   3   4   3   2   1
1   2   3   4   5   4   3   2   1
```

5. a) Write a C program to find both the largest and smallest numbers in a list of integers.

b) Write a C program that uses function to perform the following:
i) Addition of Two Matrices ii) Multiplication of Two Matrices

6. a) Write a C program to insert a sub-string in to a main string at a given position.

b) Write a C program to count the lines, words and characters in a given text.

7. a) Write a C program to generate all the prime numbers between 1 and *n*, where *n* is a value entered by the user. Define a separate function to generate prime numbers.

b) Write C program that uses recursive function to find the following.
i) Factorial of a given integer ii) GCD of two given integers

8. a) Write a C program to print the elements of an array in reverse order using pointers.

b) Write a C program to count the number of vowels and consonants in a string using pointers.

c) Write a C program to store *n* elements in an array and print the elements in sorted order using pointers.

9. a) Write a C program that performs the following operations:
i. Reading a complex number ii. Writing a complex number
iii. Addition of two complex numbers iv. Multiplication of two complex numbers
(**Note:** Represent complex number using a structure.)

b) Define a structure to store employee details include *Employee-Number, Employee-Name, Basic-pay, Date-of-Joining.* Write a C program for the following.
i. A function to store 10 employee details.
ii. A function to implement the following rules while revising the basic pay.
If Basic-pay<=Rs.5000 then increase it by 15%.

If Basic-pay> Rs.5000 and <=Rs.25000 then it increase by10%.
If Basic-pay>Rs.25000 then there is no change in Basic-pay.

iii. A function to print the details of employees who have completed 20 years of service from the Date-of-Joining.

10 a) Write a C program to reverse the first *n* characters of a given text file.

b) Write a C program to merge two files into a new file.

11 Develop a phone book application to save users contact information include name, mobile number and email id as well as to edit and delete contact details.

RESOURCES

TEXT BOOKS:

1. PradipDey and Manas Ghosh, *Programming in C*, Second Edition, Oxford University Press, New Delhi, 2013.
2. R. G. Dromey, *How to Solve it by Computer*, First Edition, Pearson Education, 2013.

REFERENCE BOOKS:

1. Byron S Gottfried and Jitender Kumar Chhabra, *Programming with C*, Fourth Edition, McGraw Hill Education, 2019.
2. Yashavant Kanetkar, *Let Us C*, Fifteenth Edition, BPB Publications, 2017.
3. E. Balagurusamy, *Programming in C*, Seventh Edition, McGraw Hill Education Pvt, Ltd, New Delhi, 2017.
4. Behrouz A. Forouzan and Richard F. Gilberg, *Computer Science: A Structured Programming Approach Using C*, Third Edition, Cengage Learning, 2008.

SOFTWARE/TOOLS:

1. Software: Turbo C++/Dev C++

VIDEO LECTURES:

1. https://www.digimat.in/nptel/courses/video/106105171/L03.html
2. https://nptel.ac.in/courses/106104128

WEB RESOURCES:

1. Learn C Programming - https://www.programiz.com/c-programming
2. Learn C Programming - https://www.tutorialspoint.com/cprogramming/index.htm
3. C Programming Exercises, Practice, Solution - https://www.w3resource.com/c-programming-exercises/
4. Basic programming exercises and solutions in C - https://codeforwin.org/2015/05/basic-programming-practice-problems.html
5. C Programming Exercises, Practice, Solution - https://www.w3resource.com/c-programming-exercises/
6. Basic programming exercises and solutions in C - https://codeforwin.org/2015/05/basic-programming-practice-problems.html

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22AI105001	DESIGN THINKING	-	1	2	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on design thinking process, evaluation of requirement specification and reflections on design experience. This course also focuses on demonstration of five phases of design thinking such as empathize, define, ideate, prototyping, testing and validation with design thinking tools and frameworks.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Investigate the requirements of a problem by conducting surveys.
CO2. Create meaningful and actionable problem statements for creative problem solving.
CO3. Construct blueprints to visualize user attitudes and behavior for gaining insights of customers.
CO4. Design prototypes of innovative products or services for a customer base.
CO5. Develop relevant products or services by choosing good design and applying empathy tools for experiencing user requirements.
CO6. Work independently and communicate effectively in oral and written forms.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	3	-	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2	1	-	1	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	2		3	-	-	-	-	-	-	-	1	-	-	3	-
CO4	-	2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	-	1	1	-	1	2	-	-	-	-	-	-	3	-
CO6	-	-	-	-	-	-	-	-	3	3	2	-	-	-	3	-
Course Correlation Mapping	**1**	**3**	**2**	**3**	**1**	**-**	**1**	**2**	**3**	**3**	**2**	**1**	**-**	**-**	**3**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

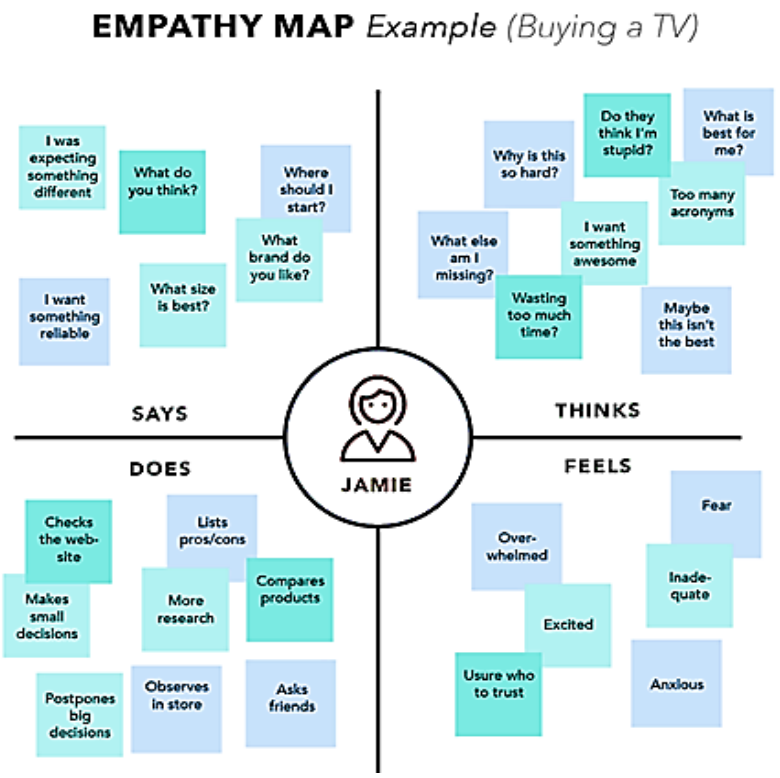
Introduction to Design Thinking – Design thinking Process, Definition, Importance, Phases of Design Thinking, Canva Tool.

1. Conduct survey and identify the problem by either individual or group and frame a problem statement using AEIOU (Activities, Environment, Interactions, Objects, Users) framework.
2. Identify demographic or focus group for problem statement and create persona and explicitly define the characteristics of persona using Canva tool.

Emphathize - Role of empathy in design thinking, Purpose of Empathy Map, Empathy Tools – Customer Journey Map, Personas, Coggle Tool.

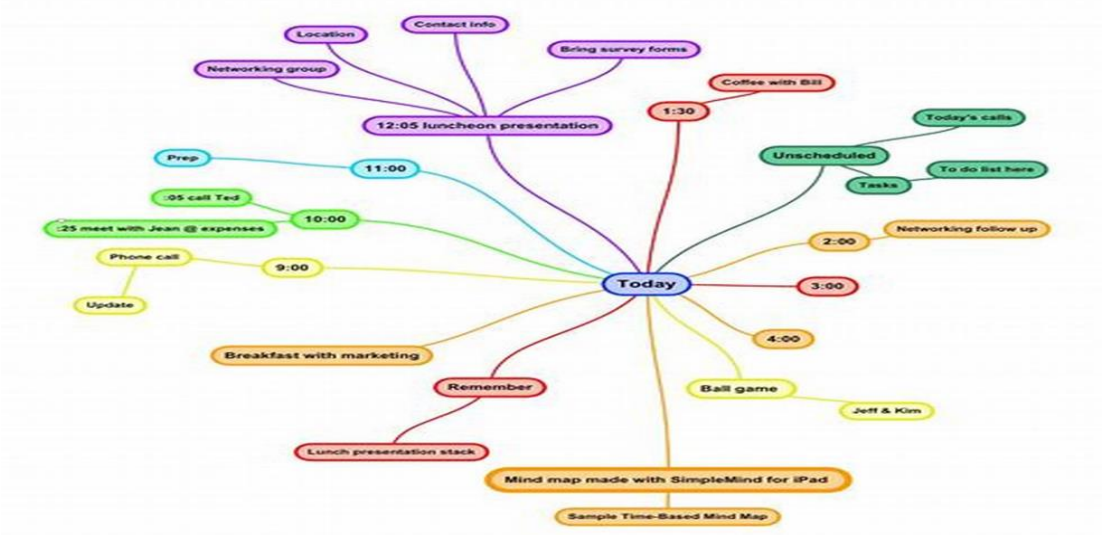
3. Build a Customer Journey Map (CJM-Before-During-After) and identify touch points for any mock scenario or persona created during last experiment and frame 2-3 questions using HMW (How Might We).

4. Create an Empathy Map using Coggle design thinking tool.
   Sample Empathy Map:



Ideation - Importance of visualizing and empathizing before ideating, Applying the method**,** Ideation Tools - Story board, Brainstorming, Mind Map, SCAMPER.

5. **Story boarding design ideas:** Consider a mock scenario and create user stories and storyboards to transform information about user needs into design concepts using any story board tool.
6. Create Mind Map for your problem statement using Coggle.
   Sample Mind Map:



7. Perform Brain Storming Session with your team and record using the SCAMPER framework and finalize the best three innovative ideas.

Prototyping and Testing – Definition, Prototype examples, Need for Prototyping, Fidelity for prototypes, Process of prototyping, Introduction to Marvel POP Software**,** Testing prototypes with users.

8. Create an application prototype for product recommendation using **Marvel POP Software**.
9. Create a **low-fidelity paper prototype** by sketching out the product design and adding relevant functionality.
10. Test the prototype created in Exercise 9 by interacting with each member of the team, walking them through the design and gathering feedback. Use feedback grid with the following quadrants: what worked, what could be improved, questions, and ideas.

What worked?	**What could be improved?**
Questions	**Ideas**

RESOURCES

REFERENCES:

1. Michael G. Luchs, Scott Swan , Abbie Griffin, "Design Thinking – New Product Essentials from PDMA",Wiley,2015.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", 2012.
3. Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products",O'Reilly,2017.
4. S.Salivahanan, S.Suresh Kumar, D. Praveen Sam, "Introduction to Design Thinking", Tata Mc Graw Hill, First Edition,2019.

SOFTWARE/TOOLS:

1. Canva (https://www.canva.com/)
2. Coggle (https://coggle.it/)
3. Marvel POP

VIDEO LECTURES:

1. https://nptel.ac.in/courses/109/104/109104109/
2. https://nptel.ac.in/courses/110106124/
3. https://www.youtube.com/watch?v=q654-kmF3Pc&t=0s
4. https://www.youtube.com/watch?v=TNAdanuvwtc
5. https://www.youtube.com/watch?v=U-hzefHdAMk
6. https://www.youtube.com/watch?v=zbLxs6te5to

WEB RESOURCES:

1. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
5. https://www.mindtools.com/pages/article/newCT_02.htm

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG102401	**ENGLISH FOR PROFESSIONALS**	2	-	2	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course deals with listening strategies, reading comprehension, grammar, vocabulary, pronunciation, Written, Verbal and Non-verbal communication, Channels of communication, Barriers to communication, Modes of technology-based communication, and Technical Communication.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the basics of Reading, Writing, Listening, and speaking skills.
CO2. Analyze the rules of English grammar in speaking and writing.
CO3. Demonstrate knowledge of English pronunciation in speaking.
CO4. Apply the knowledge of reading strategies and vocabulary in communication.
CO5. Apply the strategies of writing in preparing a report.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	3	-	2
CO2	-	3	2	-	-	-	-	-	-	3	-	2
CO3	3	2	-	-	-	-	-	-	-	3	-	2
CO4	-	-	-	-	3	-	-	-	-	3	-	2
CO5	-	-	-	-	3	-	-	-	-	3	-	2
Course Correlation Mapping	**3**	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: **SUPER HEROES – THE SCIENCE BEHIND SUPER HEROES *(06 Periods)*** Reading for Comprehension, Grammar, Speaking, Listening, Vocabulary, Writing, Verbal and Non-verbal communication.

Module 2: **ALIENS – THE CYLINDER OPENS** ***(06 Periods)***
Reading for comprehension, Grammar, Vocabulary, Writing, Listening, and Channels of communication.

Module 3: **INVENTORS – THE RAMAN EFFECT** ***(06 Periods)***
Reading comprehension, Listening, Writing, Grammar, Speaking, Pronunciation, and communication barriers.

Module 4: **HEALTH AND NUTRITION – WHAT SHOULD YOU BE EATING *(06 Periods)***
Reading comprehension, Listening, Speaking, Grammar, Writing, Pronunciation, and Modes of technology-based communication.

Module 5: **NEW-AGE ENTREPRENEURS – HOW A CHINESE BILLIONAIRE BUILT HER FORTUNE** ***(06 Periods)***

Reading comprehension, Vocabulary, Listening, Grammar, Writing, and Technical Communication

Total Periods: 30

EXPERIENTIAL LEARNING

PART-A
Any six modules among the following:

1. Conversation starters and role play
2. Reading comprehension
3. Listening comprehension
4. Vocabulary Building (business and job-related vocabulary)
5. Describing people, places, objects, and Events
6. Phonetics - Accent/ Rhythm/ Intonation
7. Tenses
8. Proposal Writing

PART-B

Any four modules among the following:

1. Communicating effectively is important to become successful in any business. Prepare a Case study of successful business personnel regarding communication competence.
2. Prepare a PowerPoint presentation on an orator and analyze the voice dynamics.
3. People face situations to convince or agree with the points they have. The college arranges a 5-day tour program to Goa. Prepare a video on persuasive talk and convince parents to get permission.
4. Write an article on the famous clichés of our time.
5. Prepare a poster on the effects of social media on youth.
6. Give a short talk on the importance of inventors and their role in present socio, political and economic changes.
7. Prepare a collage of entrepreneurs' pictures and their achievements.
8. NASA released recent photos of the universe with the help of the James Webs Space Telescope. Write down the expected impact on the existing theory on planets and the universe.
9. Obesity is the most common problem for people. List out the reasons for the problem and prepare food habits to overcome.
10. Epics of India deals with superheroes of those days. Compare the weapons used in the battles of Mahabharata with modern weapons.
11. Write a report on your recently invented product so that it should be sold as a hot cake in the market.
12. Illustrate the essential rules for good precis writing.

RESOURCES

TEXTBOOK:

1. N.P. Sudharshana & C.Savitha, *English for Technical Communication*, Cambridge University Press, 2016.

REFERENCE BOOKS:

1. Kline J. A., *Speaking effectively: Achieving excellence in presentations. Upper Saddle River,* NJ: Pearson/Prentice Hall, 2004.
2. Kuiper,*S. Contemporary business report writing* Cincinnati, OH: Thomson/South, Western, 3rd Edition, 2007.
3. Locker, K. O. & Kaczmarek, *S. K. Business communication*: *Building critical skills,* McGraw Hill, 3rd Edition, 2007.
4. Mascull, *B. Business vocabulary in use: Advanced. Cambridge,*Cambridge University Press, 2004.
5. Matthews, C. B. & Matthews, and M. *Quicksteps to winning business presentations: Make the most of your PowerPoint presentations*, McGraw Hill, 2007.
6. Marsh, C. *Strategic writing: Multimedia writing for public relations, advertising, sales and marketing, and business communication*, Pearson, 2005.
7. Munter, M. & Russell, L. *Guide to presentations*, Pearson, 2nd Edition, 2008.
8. Reardon, K. K. *The skilled negotiator: Mastering the language of engagement*, Jossey,Bass, 2004.
9. Stiff, J. B. *Persuasive communication*, Jossey, Bass, 2nd Edition 2003.

VIDEO LECTURES:

1. https://learnenglish.britishcouncil.org/general,english/video,zone/the,day,elizabeth,became,queen
2. https://www.youtube.com/watch?v=CscHc8qSn1A

WEB RESOURCES:

1. https://galgotiacollege.edu/assets/pdfs/study,material/Notes,english.pdf
2. https://lecturenotes.in/subject/183
3. https://www.fluentu.com/blog/english/professional,english/
4. https://learnenglish.britishcouncil.org/business,english

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG105402	**SOFT SKILLS**	-	-	2	-	1

Pre-Requisite -
Anti-Requisite -
Co - Requisite -

COURSE DESCRIPTION: This course deals with an understanding of the fundamental soft skills and their practical social and workplace usage. It helps participants to communicate effectively and to carry themselves confidently and in harmony with their surroundings. They also learn how to identify and overcome the barriers in interpersonal relationships, and to employ oral and written communication, teamwork, leadership, problem-solving, and decision-making skills, to gain the best results.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge of career skills by analyzing the strategies of Goal Setting, Thinking Skills, interpersonal skills, and etiquette.

CO2. Analyze various situations by applying Assertive communication and Non-verbal forms in developing Interpersonal Skills.

CO3. Apply appropriate managerial strategies by analyzing the conflicts in various situations.

CO4. Demonstrate various communication styles by analyzing and applying Thinking Skills in diverse teams as an individual and a team member and during Interviews and Group Discussions.

CO5. Analyze and apply appropriate strategies of emotional intelligence and adaptability skills for personal and professional success.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	2	-	2	-	-	-	-	2
CO2	3	3	2	-	2	-	2	-	-	2	-	2
CO3	2	2	2	-	3	-	2	-	-	-	-	2
CO4	3	2	2	-	2	-	2	-	3	2	3	2
CO5	2	2	2	-	3	-	3	-	-	2	-	3
Course Correlation Mapping	**3**	**2**	**2**	**-**	**3**	**-**	**2**	**-**	**3**	**2**	**3**	**2**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

***Any ten modules are mandatory among the following:**

Module 1: BODY LANGUAGE
Body language basics, Types of Body Language, Facial Expressions and their messages, Eye Contact Insights, Body Posture, Hand gestures, and finger movements

Module 2: ASSERTIVENESS
Communication Styles, Benefits, Asserting yourself, Tips, and Role Play

Module 3: GOALSETTING
Seven Steps of Goal Setting, Self-Motivation, Personal Goal Setting, and Setting Career Goals

Module 4: THINKING SKILLS
Positive Thinking, Creative Thinking, Lateral Thinking, Logical Thinking, and Intuitive Thinking

Module 5: TEAM BUILDING
Learning Activities, Management Essentials, and Team Building Scenarios

Module 6: CONFLICT MANAGEMENT
Ways of Resolving Conflict, Personality Types and Conflict, Conflict Resolution Process, and Team Conflict

Module 7: EMOTIONAL INTELLIGENCE
Definition, understanding emotions, Identifying emotional intelligence, and self-assessment

Module 8: ADAPTABILITY SKILLS
Understanding organizational communication, Identifying adaptability skills, and self-assessment.

Module 9: GROUP DISCUSSIONS
Types of GD, Dos, and Don'ts, Dynamics of GD ,Intervention, and Summarization Techniques

Module 10: INTERVIEW SKILLS
Planning, Opening Strategies, Answering Strategies, Teleconferencing, Videoconferencing, Practice questions, and Dress code

Module 11: INTERPERSONAL SKILLS
Starting a Conversation, Responding to a Conversation, Conversation Examples, Body Language, and Role Play

Module 12: ETIQUETTE
Basic Social Etiquette, Telephone Etiquette, Dining Etiquette, Conference Etiquette, and Email Etiquette

RESOURCES

REFERENCES:

1. Soft Skills-Lab Manual, SVEC.
2. Dr. K. Alex, *Soft Skills*, S. Chand & Company LTD, Latest Edition, New Delhi, 2018.
3. R. C. Sharma & Krishna Mohan, *Business Correspondence and Report Writing*, Tata Mc Graw, Hill Publishing Company Limited, 3rd Edition, New Delhi, 2012.
4. S.P. Dhanavel, English and Soft Skills, Orient Black Swan Private Limited, 2010.

SOFTWARE/TOOLS:

1. K-VAN Solutions.
2. Learning to Speak English 8.1, The Learning Company, 4 CDs.
3. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
4. Language in Use 1, 2 & 3.
5. Cambridge Advanced Learner's Dictionary, 3rd Edition.
6. Let's Talk English, Regional Institute of English South India

VIDEO LECTURES:

1. http://nptel.ac.in/courses/106102064
2. http://nptel.ac.in/courses/106106127/

WEB RESOURCES:

1. http://psydilab.univer.kharkov.ua/resources/ucheba/softskills/Chapter_1_Introduction.PDF
2. https://learning.tcsionhub.in/courses/tcs,ion/introduction,to,soft,skills/
3. https://goo.gl/laEHOY (dealing with complaints)
4. http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html
5. https://goo.gl/FEMGXS
6. http://www.career.vt.edu/interviewing/TelephoneInterviews.html
7. http://job,search,search.com/interviewing/behavioral_interviews
8. https://www.thebalancecareers.com/what,are,soft,skills,2060852

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG101403	**GERMAN LANGUAGE**	2	-	-	-	2

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: Oral communication; Basic grammar; Basic writing; Berufsdeutcsch (Business German)

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate basic knowledge of the German language and verb conjugation.

CO2. Comprehend and apply the knowledge of vocabulary and phrases in day-to- day real-life conversation.

CO3. Apply the various sentence structures by examining the rules of grammar in speaking and writing.

CO4. Analyze the various verb structure of English and German languages effectively in professional writing

CO5. Apply the various verb structure of English and German languages effectively in professional writing

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	2	-	-	-	-
CO2	3	-	-	-	-	-	-	2	-	-	-	-
CO3	3	-	-	-	-	-	-	2	-	-	-	-
CO4	3	-	-	-	-	-	-	2	-	-	-	-
CO5	3	-	-	-	-	-	-	2	-	-	-	-
Course Correlation Mapping	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION ***(06 Periods)***

Introduction - German alphabet, numbers, days in a week, names of months, seasons. Grammar: Nouns –(i)Nominative case and (ii) Nominative personal pronouns, simple sentence, Verb Conjugation 1st and 2nd type, verb Conjugation 3rd type, 'Wh' questions (simple sentences) Nominative (definite and indefinite) Articles.

Module 2: CITY AND FOOD ***(06 Periods)***

In the city: naming places and buildings, means of transport, basic directions. Food: drink, groceries and meals. Apartments: rooms, furniture, colours.

Grammar: Nouns-articles negation–(kein and nicht); imperative and the accusative case; Nominative Possessive Pronouns.

Module 3: DAY-TO-DAY CONVERSATIONS ***(06 Periods)***

Everyday life, telling time, making appointments, leisure activities, and celebrations. Different types of professions, Health and the body, holidays and weather, Clothes and Dresses.

Module 4: BASIC GRAMMAR ***(06 Periods)***

Grammar: Possessive articles, Prepositions (am, um, von. bis); Modal verbs, Separable verbs, accusative, past tense of 'to have' and 'to be', imperative sentences, dative case, perfect tense.

Module 5: BASIC WRITING ***(06 Periods)***

Translation from English to German and German to English, Contacts, Writing letters and Email Writing.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Prepare a report on the importance of the German language in India
2. Why is German taught in Indian schools?

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXTBOOKS:

1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tana Sieber, *Netzwerk Deutsch als Fremdsprache, Arbeitsbuch A1*, Goyal Publishers and Distributors Pvt. Ltd. 2015.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=o4GvYa-3BmY
2. https://www.youtube.com/watch?v=mrF9BizWmgk
3. https://www.youtube.com/watch?v=mojirClzQEs
4. https://www.youtube.com/watch?v=0osSyX0MmCM
5. https://www.youtube.com/watch?v=mMDOtG5ucHA

WEB RESOURCES:

1. https://learngerman.dw.com/en/beginners/c-36519789
2. https://storylearning.com/learn/german/german-tips/basic-german-phrases
3. https://study.com/academy/lesson/how-to-write-a-letter-in-german.html

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG101404	**FRENCH LANGUAGE**	2	-	-	-	2

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: Oral communication; Basic writing; Basic grammar

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate basic knowledge of the French language.
CO2. Comprehend and apply the knowledge of the alphabet in day-to-day real-life conversation.
CO3. Apply the various styles of greetings in speaking and writing.
CO4. Analyze the various conversations in French languages
CO5. Apply the French words for date and time.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	2	-	-	-	-
CO2	3	-	-	-	-	-	-	2	-	-	-	-
CO3	3	-	-	-	-	-	-	2	-	-	-	-
CO4	3	-	-	-	-	-	-	2	-	-	-	-
CO5	3	-	-	-	-	-	-	2	-	-	-	-
Course Correlation Mapping	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION ***(06 Periods)***
Introduction –Introduction, History of the French Language, Extent of the French Language, Reasons To Learn French, Book Organization, Learning French, Advice on Studying French.

Module 2: THE ALPHABET ***(06 Periods)***
etters, Punctuation, Acute Accent, Grave Accent, Tonic Accent, Stress

Module 3: GREETINGS ***(06Periods)***
Greetings, Good-byes, Names, Vous vs. tu, Courtesy, Formal Speech Titles, Asking For One's Name

Module 4: CONVERSATIONS & NUMBERS ***(06 Periods)***
How are you?, Asking How One Is Doing, Cardinal Numbers and Ordinal Numbers

Module 5: THE DATE & TIME ***(06 Periods)***
Numbers 01-31, Seasons, Days of the week, Months of the Year, Numbers 30-60, Times of Day, Asking for the time.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Prepare a report on the importance of the French language in India
2. Why is French taught in Indian schools?

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXTBOOKS:

1. The current, editable version of this book is available in Wikibooks, the open-content textbooks collection, at http://en.wikibooks.org/wiki/French

VIDEO LECTURES:

1. https://www.bing.com/videos/riverview/relatedvideo?&q=video+lecture+on+THE+ALPHABET+in+french&qpvt=video+lecture+on+THE+ALPHABET+in+french&mid=D123409C16604E0FDE26D123409C16604E0FDE26&&FORM=VRDGAR
2. https://www.youtube.com/watch?v=hd0_GZHHWeE

WEB RESOURCES:

1. https://vdocument.in/french-lecture-notespdf.html?page=2

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MM101401	**MATRIX THEORY AND LINEAR ALGEBRA**	3	-	-	-	3

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course provides a discussion on matrix factorizations, linear systems, Eigenvalues and Eigenvectors, vector spaces, linear transformations, and orthogonality.

COURSE OUTCOMES: After successful completion of the course, students will be able to:
CO1. Demonstrate the concepts of matrix factorizations and solutions of the linear system.
CO2. Determine the Eigenvalues and Eigenvectors of the matrix and implement the concept of Eigen values and decompositions of a matrix in intelligent systems.
CO3. Apply the concepts of vector spaces and linear transformation on problems of computational systems.
CO4. Use the inner product spaces for the study of orthogonality and to construct orthonormal basis.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		3	2	-	-	-	-	-	-	-	-	2	-	-
CO2	2	3		2	2	-	-	-	-	-	-	-	-	2	-	-
CO3	3	3	-	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	2	3		3	2	-	-	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	**3**	**3**	-	**3**	**2**	**-**	**-**	**-**	-	**-**	-	-	-	2	-	-

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: MATRICES AND LINEAR SYSTEM OF EQUATIONS ***(10 Periods)***
Elementary Row-operations, Elementary Matrices, Echelon form, Rank of a matrix by row-reduction, Solutions of system of linear equations by row reduction, Matrix Factorization, LU factorization, LDU factorization.

Module 2: EIGEN VALUES, EIGEN VECTORS AND DIAGONALIZATION ***(09 Periods)***
Characteristic equation of a matrix, Eigenvalues and Eigenvectors of matrices, Similarity of matrices, Diagonalization by using Eigenvalues, Cayley-Hamilton Theorem (Without Proof), Evaluation of matrix powers.

Module 3: VECTOR SPACES ***(10 Periods)***
Vector spaces, Sub-spaces, Four fundamental subspaces of a matrix, Span, Linearly independent and dependent, Basis, construction of Basis, dimensions, Finite dimensional vector space.

Module 4: LINEAR TRANSFORMATION ***(08 Periods)***

Linear transformation, Kernal and range of linear transformation, Basic properties, Invertible linear transformation, Matrix of linear transformation.

Module 5: INNER PRODUCT SPACES ***(08 Periods)***

Inner product, Norm, Distance, Inner product space, Orthogonal and orthonormal basis, Gram-Schmidt orthogonalization, Singlular Value Decomposition for square matrices.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Let Breakfast consists of orange juice, cereal, and eggs with the following nutritional information:

	OJ	Cereal	Eggs
Protein	0%	10%	20%
Vitamin C	20%	15%	0%
Calories	100	120	100

If you must have 30% protein, 30% Vitamin C and 300 calories for your breakfast, How many servings of OJ, Cereal, and Eggs should you have?

2. Solve for the Eigen values and Eigen vectors of 2x2 matrix on paper and larger matrices using MATLAB.
3. Check that the complex numbers $\square = \{x + iy / i^2 = -1, x, y \in \Re\}$, satisfy all of the conditions in the definition of vector space over $\square$. Make sure you state carefully what your rules for vector addition and scalar multiplication.

(It's an indicative one. The course instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. Peter Selinger, Matrix theory and linear algebra, 1st Edition, creative commons license, 2018.
2. Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, Linear Algebra, Pearson Education, 5th Edition, 2022.

REFERENCE BOOKS:

1. Kuladeep Sing, Linear Algebra step by step, 1st edition, Oxford University press, 2014.
2. David Poole, *Linear Algebra: A Modern Introduction*, Brooks/Cole, 2nd edition, 2005.
3. Edgar G. Goodaire, Linear Algebra, Cambridge University Press, 1st Edition, 2014.
4. M. Thamban Nair and Arindama Singh, Linear Algebra, Springer, 1st Edition, 2019.
5. Hans Schneider and George Phillip Barker, Matrices and Linear Algebra, Dover Publications, 2nd Edition, 1989.
6. Jim Defranza, Daniel Gagliardi, Introduction to Linear algebra with applications, Mc GrawHill, 2009.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/111106051
2. https://nptel.ac.in/courses/111106135

WEB RESOURCES:

1. https://catalogimages.wiley.com/images/db/pdf/9781119570271.excerpt.pdf
2. https://web.northeastern.edu/dummit/docs/linalgprac_5_eigenvalues_and_diagonalization.pdf
3. https://web.auburn.edu/holmerr/2660/Textbook/vectorspace-print.pdf
4. https://textbooks.math.gatech.edu/ila/linear-transformations.html
5. https://linear.axler.net/InnerProduct.pdf

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SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MM101403	**CALCULUS AND TRANSFORMATION TECHNIQUES**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite Transformation Techniques and Linear Algebra

Co-Requisite -

COURSE DESCRIPTION: This course consists of topics in Calculus and Transformation Techniques with applications to various engineering problems. It covers the topics, Mean Value Theorems, Taylor's and Maclaurin's Theorems. It includes functions of two or more variables together with their applications. This course is designed to train students with the basic integral transform techniques.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Make use of mean value theorems to solve engineering problems.
CO2. Identify the maxima and minima of multivariable functions.
CO3. Determine Laplace transform of different functions arising in engineering problems.
CO4. Apply Laplace transform and its inverse to solve initial and boundary value problems.
CO5. Determine the Fourier series and Fourier transforms of various functions.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	-	1	1	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	-	1	1	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	-	3	1	-	-	-	-	-	-	-	-	2	-	-
CO5	3	3	-	3	1	-	-	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	**3**	**3**	**-**	**2**	**1**	**-**	**-**	**-**	-	**-**	**-**	**-**	**-**	**2**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: SINGLE VARIABLE CALCULUS ***(08 Periods)***

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof) related problems.

Module 2: MULTIVARIABLE CALCULUS ***(07 Periods)***

Introduction to function of several variables, Jacobian and its properties, Functional dependence, Maxima and minima of functions with two variables, Lagrange's multiplier method.

Module 3: LAPLACE TRANSFORMS ***(10 Periods)***

Definition of Laplace transform, Existence conditions, Laplace transforms of standard functions, Linearity property, First and second shifting theorems, Change of scale property, Laplace transforms of derivatives and integrals, Multiplication by t^n, Division by t, Laplace transform of periodic functions (without proofs), Laplace transforms of unit step function and unit impulse function.

Module 4: INVERSE LAPLACE TRANSFORMS ***(10 Periods)***

Definition of inverse Laplace transform, Linearity property, First and second shifting theorems, Change of scale property, Inverse Laplace transforms of derivatives and integrals, Multiplication by s, Division by s, Convolution theorem (without proofs), Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

Module 5: FOURIER SERIES AND FOURIER TRANSFORMS ***(10 Periods)***

Fourier series: Determination of Fourier coefficients, Euler's formulae, Convergence of Fourier series (Dirichlet's conditions), Fourier series in $(-\pi, \pi)$, Half range sine and cosine expansions, Parseval's identity in $(0, \pi)$.

Fourier Transforms: Complex Fourier transform, Fourier sine and cosine transforms, Inverse Fourier transforms.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Obtain the Taylor series of any Single variable function (Algebraic or Transcendental) and then plot the graph of the function given using MAPLESOFT or MATLAB.
2. A 100-gm mass is suspended from a spring with constant 50 N/m. It is set into motion by raising it 10 cm above its equilibrium position and giving it a velocity of 1 m/s downward. During the subsequent motion a damping force acts on the mass and the magnitude of this force is twice the velocity of the mass. If an impulse force of magnitude 2 N is applied vertically upward to the mass at t = 3 s, find the position of the mass for all time**.**
3. Differentiate the Fourier and Laplace transforms of any time domain function with an example**.**

(It's an indicative one. The course instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2011.

REFERENCE BOOKS:

1. B. V. Ramana, *Higher Engineering Mathematics*, Tata McGraw hill, 1st edition, 2017.
2. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/111105121(Calculus)
2. tps://nptel.ac.in/111106139/ (Laplace Transform)
3. tps://nptel.ac.in/courses/111106111/ (Fourier Series and Fourier Transforms)

WEB RESOURCES:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.sosmath.com/
3. http://www.mathworld.wolfram.com/

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MM101405	NUMERICAL METHODS, PROBABILITY AND STATISTICS	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course contains various numerical methods to solve algebraic and transcendental equations and differential equations. This course also contains probability distributions and interpretation of hypothesis test for large and small samples.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Determine the approximate root of an equation and apply different methods to compute the value of interpolating polynomial at given point.

CO2 Evaluate integrals making use of quadrature formulae and solve ordinary differential equations numerically.

CO3 Use discrete and continuous distribution models to calculate probabilities for appropriate random variables.

CO4 Demonstrate and apply the basic concepts of inferences concerning means and proportions to the decision making process.

CO5 Interpret hypotheses test for small samples.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	2	-	-	-	-	-	-	-
CO2	3	3	-	3	2	-	-	-	-	-	-	-
CO3	3	3	-	3	2	-	-	-	-	-	-	-
CO4	3	3	-	3	2	-	-	-	-	-	-	-
CO5	3	3	-	3	2							
Course Correlation Mapping	**3**	**3**	**-**	**3**	**2**	**-**	**-**	**-**	-	**-**	**-**	**-**

Correlation Levels: **3: High;** **2: Medium;** **1: Low**

COURSE CONTENT

Module 1 ALGEBRAIC AND TRANSCENDENTAL EQUATONS, INTERPOLATION ***(09 Periods)***

Solution of algebraic and transcendental equations: Bisection method and Newton-Raphson's method. Finite differences, relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Lagrange's formula.

Module 2 NUMERICAL DIFFERENTIATION AND INTEGRATION ***(10 Periods)***

Numerical Differentiation- Newton's forward and backward difference formulae, numerical integration- trapezoidal rule, Simpson's 1/ 3rd and 3/ 8th rules.

Module 3 RANDOM VARIABLE AND DISTRIBUTIONS ***(09 Periods)***

Random variables (discrete and continuous), probability density functions, probability distribution: Binomial - Poisson - normal distribution and their properties (mathematical expectation and variance).

Module 4 TEST OF SIGNIFICANCE FOR LARGE SAMPLES ***(09Periods)***

Formulation of null hypothesis, critical regions, level of significance. Large sample tests: Test for single proportion, difference of proportions, test for single mean and difference of means.

Module 5 TEST OF SIGNIFICANCE FOR SMALL SAMPLES ***(08 Periods)***

Student's t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test). Chi-square test for goodness of fit.

Total Periods: 45

EXPERIENTIAL LEARNING

1. ite a Python program to solve algebraic equation by bisection method.
2. ite a Pseudo code on numerical integration using Simpson1/3 method.
3. at is the importance of probability distribution in computer science engineering?
4. you draw from a normal distribution with known values of parameters, how do you generate draws in a uniform distribution?

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 44/e, 2019.

S. Sastry,*Introductory Methods of Numerical Analysis*,Prentice Hall of India, 5th Edition, 2012.

ller and Freund's, *Probability and Statistics for Engineers*, Prentice Hall of India, 8th Edition,2011.

REFERENCE BOOKS:

1. win Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 9th Edition, 2006.
2. K.V.Iyenger, Krishna Gandhi and others, *Probability & Statistics*, S.Chand.
3. C. Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons Publications, 11th Edition, 2012.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/127106019
2. https://nptel.ac.in/courses/111106112
3. https://nptel.ac.in/courses/111105041
4. https://nptel.ac.in/courses/111106112

WEB RESOURCES:

1. https://www.pdfdrive.com/introductory-methods-of-numerical-analysis-by-ss-sastry-d148704487.html
2. https://faculty.ksu.edu.sa/sites/default/files/probability_and_statistics_for_engineering_and_the_sciences.pdf
3. http://brharnetc.edu.in/br/wp-content/uploads/2018/11/21.pdf
4. http://www.mi.sanu.ac.rs/~gvm/Teze/Numerical%20methods%20In%20Computational%20Engineering.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MM101407	NUMBER THEORY AND ALGEBRA	3	-	-	-	3

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: The course contains various topics related to Number theory and its applications, Rings, ideals, polynomial rings and finite fields. In particular this contains the topics related to arithmetic functions and congruences which are helpful to the students in cryptography and Network security related topics in computer sciences.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Demonstrate the knowledge on the concepts of Basic number theory and their applications in computer sciences.

CO2 Apply knowledge congruences in the computer programming involved in network security issues

CO3 Evaluating and analyze the results and concepts in cryptography through the knowledge of Arithmetic functions and their properties.

CO4 Apply the techniques of abstract algebra in evaluation of the problems in network security.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	1	-	-	-	-	-	-	-
CO2	3	3	-	2	2	-	-	-	-	-	-	-
CO3	3	3	-	2	1	-	-	-	-	-	-	-
CO4	3	3	-	2	1	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	-	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1 BASIC NUMBER THEORY ***(09 Periods)***

Divisibility of integers, GCD and LCM of integers and their properties, Prime numbers and their properties, Euclidean algorithm.

Module 2 CONGRUENCES ***(09 Periods)***

Congruences and their elementary properties, Complete and reduced residue systems, Linear congruences, Chinese Remainder theorem, Fermat's theorem, Wilson's theorem, Applications.

Module 3 ARITHMETIC FUNCTIONS ***(09 Periods)***

Arithmetic functions, multiplicative and totally multiplicative functions, Euler's totient function, Divisor function, Sum of divisors (The function σ), Mobius function ($\mu(n)$), Elementary properties of arithmetic functions.

Module 4 RINGS AND IDEALS ***(09 Periods)***

Rings, examples of Rings. Basic properties, Integral domain, Field and Ideals, Ring homomorphism and isomorphism.

Module 5 POLYNOMIAL RINGS AND FINITE FIELDS ***(09Periods)***

Polynomial ring in one variable, Irreducible polynomials over finite fields, Factorization polynomial over finite fields, properties of finite fields, Primitive roots.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Exhibit the complete residue system modulo 17 composed entirely of multiples of 3.
2. Analyse the numbers and prove every square number is of the form 5k-1, 5k, 5k+1, where n is some positive integer.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

Nadiya Gubareni, *Introduction to Modern Algebra and its applications*, CRC Press, 2019.

K.C. Chowdhury, *A first course in Number Theory*, Asian Books, First edition, 2004.

Hiram Paley, Paul M. Weichsel, *First course in Abstract Algebra*, Holt, Rinehart and Winston, First Edition, 1966.

Joseph Silverman, *A Friendly introduction to Number Theory*, Pearson Publishers, 5th Edition, 2019.

Edwin Weiss, *First course in Algebra and Number Theory*, Academic Press, 1971.

REFERENCE BOOKS:

1. Papantonopoulou, Algebra, *Pure and Applied Mathematics*, Prentice Hall, 2002.
2. Arkadii slinko, *Algebra fir applications*, Springer Publications, 2015.
3. Abhijit Das, *Computational Number Theory*, CRC Press, 2013.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=yHwneN6zJmU
2. https://www.youtube.com/watch?v=6DfXcNv6as4
3. https://www.youtube.com/watch?v=MNj_e-t9tIs&list=PLLtQL9wSL16htZdyMm99giCaam049Od4x
4. https://www.youtube.com/playlist?list=PLU6SqdYcYsfLyL330UDwLrRvNvWbto7DR

WEB RESOURCES:

1. https://math.libretexts.org/Courses/Mount_Royal_University/MATH_2150%3A_Higher_Arithmetic/4%3A_Greatest_Common_Divisor_least_common_multiple_and_Euclidean_Algorithm
2. https://ocw.mit.edu/courses/18-781-theory-of-numbers-spring-2012/de23a8d881a615303f6d4fa665669dc9_MIT18_781S12_lec4.pdf
3. https://crypto.stanford.edu/pbc/notes/numbertheory/mult.html
4. https://sites.math.washington.edu/~bviray/teaching/RingHomomorphismsAndIsomorphisms.pdf
5. https://www.birs.ca/workshops/2006/06w5021/report06w5021.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MM101408	STATISTICS FOR ENGINEERS	3	-	-	-	3

Pre-Requisite - 22MM101408- Numerical Methods, Probability and Statistics

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on different sample collection methods, correlation and regression, ANOVA, non parametric tests and statistical quality control and also real-time applications of all these different types' statistical techniques. This course also gives ability to implement features of ANOVA and experimental design and to perform the data analysis by using non parametric tests.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 entity different sample collection methods, probability theorems, interpretation and presentation techniques for decision making.
CO2 Analyse correlation and regression to measure the relationship between two variables.
CO3 Apply ANOVA concepts to make a confident and reliable decision.
CO4 Perform data analysis using non- parametric tests.
CO5 Apply statistical quality control to design charts for monitoring the process performance of a continuous data.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	2	3	2	1	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: DESCRIPTIVE STATISTICS AND PROBABILITY ***(10 Periods)***

Descriptive Statistics: Collection of data, Classification and Tabulation of data, Diagrammatic and Graphic representation of data, Measures of Central value - Mean, Median, Mode; Measures of Dispersion- Quartile deviation, Mean deviation, Standard deviation;

Probability: Definition of probability, Addition theorem, Multiplication theorem, Bayes' theorem.

Module 2: CORRELATION ANALYSIS & REGRESSION ANALYSIS ***(09 Periods)***

Correlation Analysis: Introduction to Correlation, Types of Correlation, Methods of Studying Correlation, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient, Partial Correlation, Multiple Correlation.

Regression Analysis: Introduction and uses of Regression Analysis, Difference between Correlation and regression analysis, Regression lines*, Regression equations.*

Module 3 ANOVA & EXPERIMENTAL DESIGN ***(10 Periods)***

ANOVA: Introduction to ANOVA , Assumptions of ANOVA, Techniques of ANOVA, , ANOVA in One way and Two-Way Classification Model,

Experimental Design: Randomized Block Design, Latin Squares, Randomized Blocks Vs Latin Square.

Module 4 NON-PARAMETRIC TESTS ***(08 Periods)***

Introduction to Non-Parametric tests, Advantages of Non-Parametric Tests, The Sign Test, A Rank Sum Test: The Mann-Whitney U-Test, The One Sample Runs Test, The Kruskal-Wallis Or H-Test.

Module 5 STATISTICAL QUALITY CONTROL ***(08 Periods)***

Introduction to SQC, Advantages and limitations of SQC, Control Charts, $\bar{X}$ Chart, R Chart, Control Chart for C, Control Chart for P.

Total Periods: 45

EXPERIENTIAL LEARNING:

1. Let's say you golfed nine holes. Each number below represents the number of swings it took you to sink the ball in the hole. If you're lucky and you have some golf skills, your score is the following:

   8, 4, 10, 4, 4, 5, 4, 5, 6

   You go back into the clubhouse and are quite pleased with your score. Your friend says that his mean score was 6, his median was 7 and his mode was 6. Did you score better than your friend?
2. A Company organizes meetings often. Find the efficiency of the meetings using correlation analysis by considering two values. Namely, time spent for the meetings and positive ideas came out of the meeting. Draw a graph to analyse the efficiency the meeting conducted in a year.
3. A large scale farm is interested in understanding which of three different fertilizers leads to the highest crop yield. They sprinkle each fertilizer on ten different fields and measure the total yield at the end of the growing season. To understand whether there is a statistically significant difference in the mean yield that results from these three fertilizers, conduct ANOVA using "type of fertilizer" as the factor and "crop yield" as the response.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOK(S):

1. S.P. Gupta and Sultan, *Statistical Methods*, Chand & Sons Publication, 44th Edition, 2017.

REFERENCE BOOK(S):

1. Jay L.Devore, *Probability and Statistics for Engineering and Sciences*, Cengage Learning, 2015.
2. Ronals E.Walpole, Raymond H.Mayers, Sharon L.Myers, Keying E.Ye, *Probability and Statistics for Engineers and Scientists*, Pearson Publication, 9th Edition, 2014.
3. Shankar Rao, *Probability and Statistics for Science and Engineering*, University Press, 2015

VIDEO LECTURES:

1. https://archive.nptel.ac.in/courses/102/106/102106051/
2. https://archive.nptel.ac.in/courses/110/107/110107114/
3. https://archive.nptel.ac.in/courses/102/101/102101056/
4. https://archive.nptel.ac.in/courses/111/104/111104120/
5. (164) Statistics 101: ANOVA, A Visual Introduction - YouTube

6. https://www.youtube.com/watch?v=qb3mvJ1gb9g

WEB RESOURCES:

1. https://intranet.missouriwestern.edu/cas/wp-content/uploads/sites/17/2020/05/Measures-of-Central-Tendency-2014.pdf
2. http://www.uop.edu.pk/ocontents/Chatper%202.pdf
3. https://rcub.ac.in/econtent/ug/bcom/sem4/Business%20Statistics%20Unit%204%20Correlation%20and%20Regression.pdf
4. https://www.stats.ox.ac.uk/pub/bdr/IAUL/ModellingLecture4.pdf
5. https://web.lemoyne.edu/courseinformation/MTH%20112/RINAMAN/instman/CH14.PDF
6. http://ndl.ethernet.edu.et/bitstream/123456789/78721/2/Lecture%20Note%20Statistical%20Quality%20Control%20.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22AI105002	**DISRUPTIVE TECHNOLOGIES**	-	1	2	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on Google AI tools for speech recognition, language detection and Python API to build Machine Learning Models. This course also focuses on demonstration of Cloud Services and tools, Internet of Things with Arduino and simulation of robots using robotics development platform.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Use Google AI tools for speech recognition and language detection.
CO2. Construct Machine Learning Models using Python API to solve Classification problems.
CO3. Use Cloud Services and tools for effective collaboration and data sharing
CO4. Design an interface to embedded systems using real time sensors with Arduino.
CO5. Design and simulate robot using robotic simulation platforms for societal applications.
CO6. Work independently and communicate effectively in oral and written forms.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	3	3	2	-	-	-	-	-	-	-	3	-	-
CO2	2	3	3	3	3	2	-	-	-	-	-	-	-	3	-	-
CO3	2	-	-	-	3		-	-	-	-	-	-	-	3	-	-
CO4	2	-	3	-	2	2	2	-	-	-	-	-	-	3	-	-
CO5	2	-	3	-	-	2	-	-	-	-	-	-	-	3	-	-
CO6	-	-	-	-	-	-	-	-	3	3	-	-	-	3	-	-
Course Correlation Mapping	**2**	**3**	**3**	**3**	**3**	**2**	**2**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

Artificial Intelligence – Introduction, Applications, Trends, Technologies, Relevant Libraries/API; Machine Learning – Introduction, Applications, Python Libraries/API.

1. Speech Recognition: Read an audio file with Python and use the Google Speech Recognition API to perform conversion of Speech to Text.
2. Language Detection: Detect the language of the text using Language Detection Library (langdetect) ported from Google's language detection.
3. Object Detection: Detect multiple objects present in an image using Detection-Facebook's API.
4. Build a classification model using Decision Tree learning algorithm. Use Iris dataset and scikit-learn python library to build the model.

Cloud Computing – Introduction, Applications, Services - PaaS, IaaS, SaaS, Virtualization, Application Deployment.

1. Create Windows virtual machine using VMware workstation under IaaS.
2. Create online survey forms, questionnaires and analyse the result of survey using Zoho under SaaS.
3. Develop a web application and deploy the same on Amazon Simple Storage Service.

Internet of Things - Introduction, Applications, Arduino IDE, Servo Motor, Sensors, ECG System.

4. Design and simulate Servo motor interfacing with Arduino.
5. Design and simulate Flame Sensor interfacing with Arduino.
6. Design and implement an IoT ECG (Electrocardiogram) System to recordhearts electrical activity.

Robotics - Introduction, Applications, understanding robotics development platform to model, Program and Simulate robots.

7. Design a Two Wheel line following robot integrated with infrared sensors.
8. Design a collision avoidance robot in multi obstacle based environment.

RESOURCES

TEXT BOOK:

1. Sebastian Raschka, Vahid Mirjalili, Python Machine Learning, Packt Publishing, 3rd Edition, 2019.

REFERENCE BOOK

1. Simon Monk, Programming Arduino, Second Edition, McGraw-Hill Education,2016.

SOFTWARE/TOOLS:

1. Python – Google Speech Recognition API, Google langdetect API, Scikit-learn
2. Virtual Box and Virtual PC Software
3. Arduino Kit, Python/C
4. CoppeliaSim

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=lKra6E_tp5U
2. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
3. https://www.youtube.com/watch?v=H_ustCy4Ks8
4. https://onlinecourses.nptel.ac.in/noc21_cs17/preview
5. https://www.youtube.com/watch?v=xq_JKhbYWKk
6. https://www.youtube.com/watch?v=uBLcAz7obwA

WEB RESOURCES:

1. https://gsuite.google.com/learning-center/products/#!/
2. https://pypi.org/project/langdetect/
3. https://cloud.google.com/translate/docs
4. https://scikit-learn.org/stable/modules/generated/sklearn.tree.DecisionTreeClassifier.html
5. Understanding Amazon Web Services, https://aws.amazon.com/

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22AI105003	**FREE AND OPEN SOURCE SOFTWARE**	-	1	2	-	2

Pre-Requisite Programming for Problem Solving

Anti-Requisite -

Co-Requisite Object Oriented Programming through Java

COURSE DESCRIPTION: This course covers the basic programming constructs of Go language. It emphasizes the concepts including string handling and implementation of HTTP protocols in Go language. The course also provides hands on training on application development using MIT app inventor and GIT commands related to repositories.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Create source code repositories using GitHub.

CO2. Create communication between client to server and develop interactive software applications using GO language.

CO3. Develop basic mobile applications using MIT App inventor.

CO4. Work independently and communicate effectively in oral and written Forms.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3	3	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	-	3	3	-	3	-	-	-	-	-	-	-	3	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO4	3	-	3	-	3	-	3	-	-	-	-	-	-	-	3	-
Course Correlation Mapping	**3**	**2**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	-

Correlation Levels: 3: High; 2: Medium;1: Low

EXPERIENTIAL LEARNING

List of Experiments:
GIT HUB

Theory Topics: Git Basics, Git repositories, local repositories, remote repositories, Secure shell encryption algorithm.

1. Configuration of Git using gitconfig, gitlog and gitaliases commands.
2. Initializing the local repositories using Git commands: add, commit and status.
3. Moving the local repository to the Git hub using the commands remote, push and pull.
4. Creation of remote access to Github using SSH key.
5. I/O management system with Github using branch and merge techniques.

Go Programming Language

Theory Topics: Variables, Data types, Conditional statements, Looping statements, strings.

1. Peano numbers are a simple way of representing the natural numbers using only a zero value and a successor function. Ex. 0->1->2->3->5…. Write a GO program to generate Peano integers.
2. Write a GO program to check if two trees are equivalent if they both have the same topology and if the objects contained in corresponding nodes are equal.

3. Hypertext Transfer Protocol (HTTP) is an application-layer protocol for transmitting hypermedia documents. It was designed for communication between web client and web servers. Write a program to configure HTTP server for establishing a simple client – server communication.
4. Code the solutions to a few string-related hacker rank problems.

Ex: Prints the text of each line that appears more than once in the standard input, preceded by its count.

Build Apps with MIT App Inventor

Theory Topics: Frames, Blocks, embedding audio & video

1. Develop the Hello Codi App by using MIT App Inventor with the components: Blocks Editor, audio, video, clock timer.
2. Develop a Digital Doodle Application using MIT App Inventor.

RESOURCES

TEXT BOOK

1. Scott chacon, Ben Straub, *Pro Git*, Second Edition, APress open, 2014.

REFERENCE BOOK

1. Alan A. A. Donovan, Brain W. Kernighan, *The Go Programming Language,*First Edition, Addison-Wesley, New York, 2005.
2. https://gophercises.com/.

IT App Inventor

1. http://appinventor.mit.edu/

SOFTWARES/TOOLS used:

1. System Software: Git hub, Go Compiler & MIT App Inventer.

VIDEO LECTURES:

1. https://onlinecourses.swayam2.ac.in/aic20_sp37/preview
2. https://www.coursera.org/courses?query=github
3. https://www.youtube.com/c/Freecodecamp
4. https://www.simplilearn.com/tutorials/git-tutorial/git-tutorial-for-beginner

WEB RESOURCES:

1. https://docs.github.com/en
2. tps://go.dev/doc/tutorial/getting-started
3. https://appinventor.mit.edu/explore/ai2/tutorials

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CB105001	COMPUTER HARDWARE AND SYSTEM ESSENTIALS	-	1	2	-	2

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on internal components of a computer, assemble a computer system, install an operating system, and troubleshoot using system tools and diagnostic software. Students will also be able to understand various network cables, connectors and TCP/IP networks, and work group.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Identify different hardware components on personal computer and peripheral devices.
CO2. Create network architecture using TCP and UDP protocols for data transmission.
CO3. Devise the solutions for the problems occurred in personal computer in Operating Systems.
CO4. Implement the functionalities of different peripheral devices and networks by configuring multi-functional devices.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	1	1	-	-	-	-	-	-	-	-	-	-	3
CO2	3	-	3		1	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	1	2	-	-	-	-	-	-	-	-	-	-	3
CO4	3	2	3	1		-	-	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	**3**	**3**	**3**	**1**	**1**	**-**	**-**	**-**	-	**-**	**-**	**-**	**-**	**-**	**-**	**3**

Correlation Levels: 3: High; 2: Medium; 1: Low

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

HARDWARE CONFIGURATION

Peripherals of the computer

1. Implement the following activities:
   a) Configure settings using BIOS/UEFI tools on a PC.
   b) Identify different components of mother board
   c) Analyze various RAM types, PC extensions cards and storage devices
2. Implement the following activities:
   a) Identify various CPU's, cooling methods and PC connection interfaces
   b) Identification of various power supply, display devices and common PC Connectors
   c) Install and configure common peripheral devices and SOHO multi-function device

PC Networking using Packet Tracer

Network Types and Components, Topologies, Wired and Wireless Transmission, Protocols.

1. a) Identify various types of network cables and connectors and characteristics
   b) Implement the following characteristics of TCP/IP
   i)IPv4 and IPv6 ii)Client side DNS Settings

2. a) Identify following TCP and UDP Ports
   i)21-FTP ii)443-HTTPS iii)80-HTTP iv)Telnet
   b) Analyze the following TCP and UDP protocols
   i)SMD ii)SNMP iii)DHCP
3. a) Configure the following network types
   i) LAN ii) WAN iii) WLAN
   b) Configure network architecture using the following
   i) HUB ii) Switch iii) Router

OPERATING SYSTEMS

Introduction to Operating System, Characteristics of Operating System, Types of Operating System and its components

1. Installation of Windows Operating System
2. Installation of Application and Device Drivers management

TROUBLESHOOTING

Introduction to trouble shooting, Hardware and Software Trouble shooting

1. a) Study the common problems related to the following
   i) Mother Board ii) RAM iii) CPU iV) Power
   b) Troubleshoot the following failures
   i) Read/Write Failure ii) Slow Performance iii) Failure to boot
2. Trouble Shoot the following symptoms of Video, projector and display issues
   i) VGA Mode ii) No Image of Screen iii) Dead Pixels iv) Color patterns
3. Trouble shoot the following issues of wired, wireless and mobile devices
   i) No Connectivity ii) IP conflict iii) Ghost Cursor iv) Stiking Keys

RESOURCES

TEXT BOOK

1. David Anfinson, Allan Johnson and Kathleen Czurda, *IT Essentials v7 Companion Guide*, CISCO Press, 2020
2. Brian W. Kernighan, *Understanding the Digital World: What You Need to Know about Computers, the Internet, Privacy, and Security*, Second Edition, Princeton University Press, 2021

REFERENCE BOOK

1. Kavin Wilson, Exploring Computer Systems: The Illustrated Guide to Understanding Computer Systems, Hardware &Networks, Elluminent Press, 2019

SOFTWARE/TOOLS:

1. Windows 8/10 operating systems
2. Cisco Packet Tracer

VIDEO LECTURES:

1. https://www.edx.org/course/computer-hardware-and-operating-systems
2. https://www.coursera.org/learn/computer-hardware-software

WEB RESOURCES:

1. https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/configuration/15-s/ir-15-s-book.pdf
2. https://www.certexams.com/comptia/a+/cert-notes-aplus-networking.htm
3. https://www.rcboe.org/cms/lib/GA01903614/Centricity/Domain/4399/Network%20n10-007.pdf
4. https://www.tutorialsweb.com/CertNotes/CompTIA-cert/A+/aplus-prac-10.htm

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22AI104001	OBJECT ORIENTED PROGRAMMING THROUGH C++	3	-	2	4	5

Pre-Requisite Programming for Problem solving

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on basic characteristics of Object Oriented Programming through C++. It covers basic Object Oriented Programming paradigms like Classes and Objects in custom application development. The OOP concepts types of overloading and inheritance are also covered. It provides hands-on experience inimplementation of OOP features and other programming concepts like handling pointers, file and exceptions.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the concepts of Object oriented programming.

CO2. Apply function and operator overloading techniques for code optimization.

CO3. Apply inheritance and virtual functions to implement dynamic binding.

CO4. Develop robust applications using exception handling mechanism and file I/O.

CO5. Develop reliable applications to solve real world problems using Object oriented programming constructs.

CO6. Work independently or in team to solve problems with effective communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	2	3	2	-	-	-	-	-	-	-	-	-	3	-
CO3	3	2	2	3	2	-	-	-	-	-	-	-	-	-	3	-
CO4	3	2	3	3	2	-	1	-	-	-	-	-	-	-	3	-
CO5	3	2	3	3	2	-	1	-	-	-	-	-	-	-	3	-
CO6	-	-	-	-	-	-	-	-	3	3	-	-	-	-	3	-
Course Correlation Mapping	**3**	**2**	**2.6**	**2.6**	**2**	-	**1**	-	3	**3**	-	-	-	-	3	-

Correlation Levels: 3: High; 2: Medium;1: Low

COURSE CONTENT

Module 1: C++ FUNDAMENTALS ***(10 Periods)***

Need of Object-Oriented Programming - Comparison of procedural programming and Object-Oriented Programming - Characteristics of Object-Oriented Languages - C++ Programming Basics: Basic Program Construction - Data Types, Variables, Constants - Type Conversion, Operators, Library Functions - Loops and Decisions, Structures - Functions : Simple Functions, Passing arguments, Returning values, Reference Arguments. - Recursion, Inline Functions, Default Arguments - Storage Classes - Arrays, Strings.

Module 2: OOP FUNDAMENTALS ***(09 Periods)***

Classes and Objects: Classes, Friend functions, Friend classes, Inline functions, Parameterized constructors, Static Class Members, The Scope resolution operator, nested and local classes, Passing Objects to functions, returning objects, object assignment. Arrays, Pointers, References: Array of Objects, Pointers to objects, the This pointer.

Module 3 FUNCTION AND OPERATOR OVERLOADING ***(09 Periods)***

Function Overloading: Copy Constructors, and Default Arguments: Function Overloading, Overloading Constructors, Copy constructors, Default Function Arguments.

Operator Overloading: Creating a member operator function, operator overloading using a friend function, overloading new and delete, overloading some special operators, and comma operator.

Module 4 INHERITANCE AND VIRTUAL FUNCTIONS ***(09 Periods)***

Inheritance: Base Class Access Control, Inheritance and protected members, inheriting multiple base classes, constructors, destructors, and inheritance, granting access, virtual base classes.

Virtual Functions: Pointers to objects, Pointers to derived classes, Virtual Functions, Pure Virtual Functions.

Module 5 FILE I/O AND EXCEPTIONS ***(08 Periods)***

Files: File Pointers - Error handling in File I/O - File I/O with member Functions - Overloading the extraction and Insertion Operators - Multi File Programs

Exceptions: Need of Exceptions, keywords, Simple and Multiple Exceptions - Re-throwing Exception and Exception Specifications, Custom Exception

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

OOPS & C++ Fundamentals

1. a. Write a C++ program to identify appropriate data types and variables to find the size of various datatypes. Display the variables along with their size.

   b. Write a C++ program to take name, address as character array, age as int, salary as float and contains inline functions to set the values and display it.

2. a. Write a C++ program to display names, roll no and grades of 3 students whohave appeared in examination. Declare the class of name, roll no and grade. Create an array of class objects, read and display the contents of array.

   b. Create a class TIME with members hours, minutes, seconds. Take input, add two time objects passing objects to function and display the resultant time in hours, minutes &seconds.

3. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.Write a C++ program to read the data of N employee and compute Net salary of eachemployee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).

POLYMORPHISM

4. a. Create a base class basic_info with data members name ,roll no, sex and two member functions getdata and display. Derive a class physical_fit from basic_info which has data members height and weight and member functions getdata and display. Display all the information using object of derived class.

   b. Consider two complex number in the form a+bi and c+dj, Write a program overload binary + operator to perform addition of the complex numbers.

INHERITANCE

5 a. Write a C++ Program to calculate the area and perimeter of rectangles using concept of Hierarchical inheritance. Area class is derived from base class Rectangle. Perimeter class is also derived from base class Rectangle.

b. Write a C++ program to create Employee and Student inheriting from Person using Hierarchical Inheritance. The Person class should contain the common attributes of Employee and Student class.

6. Design three classes STUDENT, EXAM and RESULT. The STUDENT class has data members such as rollno, name. Create a class EXAM by inheriting the STUDENT class. The EXAM class adds data members representing the marks scored in six subjects. Derive the RESULT from the EXAM class and has its own data members such as total marks. Write a C++ program to model this relationship.

7. Create a base class called SHAPE. Use this class to store two double type values. Derive two specific classes called TRIANGLE and RECTANGLE from the base class. Add to the base class, a member function getdata() to initialize base class data members and another member function display to compute and display the area of figures. Make display a virtual function and redefine this function in the derived classes to suit their requirements. Using these three classes design a program that will accept driven of a TRIANGLE or RECTANGLE interactively and display the area.

FILE I/O

8. a. Write a C++ program named store_temps.cpp that creates a file named raw_temps.txt with temperature data. Fill thefile with at least 50 temperature readings.

b. Assuming that a text file named FIRST.TXT contains some text written into it, write a function named copyupper() in C++, that reads the file FIRST.TXT and creates a new file named SECOND.TXT contains all words from the file FIRST.TXT in uppercase.

9. Write a C++ program that accepts two file names and produces a new file that is thecontents of the first file followed by the contents of the second; that is, the programconcatenates the two files.

EXCEPTION HANDLING

10. Add an exception handler (try/catch/throw) to the class that throws an error message (e.g. "value out of range") in the getValue function that is caught and handled in the main program. Implement two version of the program. In version1, throw the error in getValue, catch the error in the main, display an error message in the main, and then allow the program to terminate. In the second version, perform the same basic actions (throw and catch) but keep re-invoking the getValue function from the main program until the user enters a valid value.

PROJECT BASED LEARNING:

Faculty shall provide Projects relevant to the contents of the course.

Sample Projects:

1. Bookshop inventory system

The project is to build the bookshop inventory system in C++ that helps to keep track of all the book records in a shop. Below are the features to be implemented:

- Add new book and the details of the book are:
  - Book ID
  - Name of book
  - Name of Author
  - Number of books
- Delete a book

- Update anexistingbook detail
- Display summary of all the books
- Search a book

2. Online Examination Management System

The project is to build the online examination management system in C++ that helps to conduct online proctored examinations. Below are the features to be implemented:

- Add New Students
- Student Login
  - Registration for examination
  - Attempting the questions
- Faculty Login
  - Uploading the questions
- Proctor Login
  - Online monitoring of students
- Admin View
  - Consolidation of marks
  - Release of results

RESOURCES

TEXT BOOKS:

1. Herbert Schildt,"C++ - The Complete Reference", 4th edition, Tata McGraw Hill, 2018.
2. E.Balaguruswamy "Object Oriented Programming with C++", 6th edition, Tata McGraw Hill
   Education, 2015.

REFERENCE BOOKS:

1. Cohoon and Davidson, "C++ Program Design: An introduction to Programming and object – Oriented Design", 3rd Edition, Tata McGraw Hill, 2003.
2. Robert Lafore, "Object-Oriented Programmig in C++", 4th edition, Pearson Education, 2008.
3. Walter Savitch,**"**Problem Solving with C++", 9th edition, Pearson Education, 2015.

SOFTWARE/TOOLS:

1. Software: Dev C++

VIDEO LECTURES:

1. https://www.coursera.org/learn/c-plus-plus-a#syllabus
2. https://www.udemy.com/free-learn-c-tutorial-beginners/
3. https://onlinecourses.nptel.ac.in/noc21_cs02/preview

WEB RESOURCES:

1. http://www.cplusplus.com/files/tutorial.pdf
2. tp://mazonka.com/shared/Straustrup4th.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CM101401	**PRINCIPLES OF BUSINESS ECONOMICS AND ACCOUNTANCY**	3	-	-	-	3

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION:
Business economics and demand analysis; theory of production and cost analysis; markets and pricing; principles of accounting and capital; final accounts and tally ERP9.0.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the principles of Business Economics and theories of Demand.

CO2. Apply the theories of Production and Cost to the managerial decision-making of an organization.

CO3. Determine the Price and Output relation in the different Market structures.

CO4. Demonstrate the principles of Accountancy and sources of Capital

CO5. Analyze the profitability and soundness of an organization.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	1	-	3	-	2
CO2	3	2	-	-	-	-	-	1	-	3	-	2
CO3	3	2	-	-	-	-	-	1	-	3	-	2
CO4	3	2	1	-	-	-	-	1	-	3	-	2
CO5	3	2	1	-	-	-	-	1	-	3	-	2
Course Correlation Mapping	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**3**	**-**	**2**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BUSINESS ECONOMICS AND DEMAND ANALYSIS *(09 Periods)*

Definition - Nature and Scope of Business Economics - Demand: Determinants of demand – Demand function - Law of demand, assumptions, and exceptions - Elasticity of demand –Types of elasticity of demand-Demand forecasting and methods of demand forecasting.

Module 2 THEORY OF PRODUCTION AND COST ANALYSIS (09 *Periods)*

Production Function: Input-output relationship-Law of Variable proportion-Isoquants and Isocosts

Cost Concepts: Total, Average and Marginal Cost **-** Fixed vs. Variable costs – Opportunity Costs Vs Outlay Costs– Separable Costs Vs Joint Costs, Urgent Costs Vs Postponable Costs-Avoidable Costs Vs Unavoidable Costs

Break Even Analysis (BEA)–Assumptions, Merits and demerits- Determination of Break-

Even Point (Simple problems).

Module 3: MARKETS AND PRICING ***(09 Periods)***

Market Structure: Types of Markets - Features of perfect competition - Monopoly and monopolistic competition - Price and Output determination in perfect competition, monopoly and monopolistic Markets.

Pricing: Objectives and policies of pricing – Sealed bid pricing - Marginal cost pricing – Cost plus pricing - Going rate pricing – penetration Pricing – skimming Pricing - Block pricing – Peakl oad pricing – Cross subsidization.

Module 4 : **PRINCIPLES O FACCOUNTING & CAPITAL** ***(09 Periods)***

Accountancy: Introduction – Concepts – Conventions – Double Entry Book Keeping– Journal – Ledger - Trial Balance (Simple problems)

Capital: Significance- Types of capital – Sources of Capital.

Module 5: **FINAL ACCOUNTS & TALLY ERP9.0** ***(09 Periods)***

Introduction to Final Accounts – Trading account - Profit and Loss account and Balance Sheet with simple adjustments (Simple problems)

Tally ERP 9.0: Introduction – Create a company – Create ledger – Posting vouchers – Advantages of Tally.

Total Periods:45

EXPERIENTIAL LEARNING:

1. Prepare the Journal Entries by the students with practical examples.
2. Conduct an event about the market structure.
3. Do the problems on Financial Statements with practical examples.
4. Prepare are port regarding the demand and supply of electric vehicles in the Indian market.
5. From the following balances of Mr. Aravind as at 31.12.2016, prepare Trading, Profit and Loss Account for the year ended and Balance Sheet as at that date after making the necessary adjustments.

Debit Balances	Amount(Rs.)	Credit Balances	Amount(Rs.)
Drawing Account	6,000	Capital	80,000
Plant and Machinery	25,000	Sundry Creditors	10,000
Stock(opening)	15,000	Sales	1,20,000
Purchases	82,000	Returns outwards	1,000
Return Inwards	2,000	R.B.D.D.	400
Sundry Debtors	20,600	Discounts	800
Furniture & Fixtures	5,000	Rent of Premises sublet	1,200
Freight and Duty	2,000	Reserve Fund	5,000
Carriage outwards	500		
Rent, Rates & Taxes	4,600		
Printing & Stationery	800		
Trade Expenses	400		
Postage and Telegrams	800		
Insurance charges	700		
Salaries and Wages	21,300		
Cash in Hand	6,200		
Cash at Bank	25,500		
	2,18,400		2,18,400

Adjustments:

- Stock on 31.12.2006 was Rs.14,600.
- Write off Rs.600 as bad debts and provide 5% for R.B.D.D.

- Provide for depreciation on furniture 5% & Plant & Machinery at 20%.
- Insurance prepaid was Rs.100.
- Outstanding salaries Rs.700
- A fire occurred on 25th December 2006 and stock worth Rs.5,000 was destroyed and the insurance company admitted a claim for Rs.4500 only.

RESOURCES:

TEXT BOOKS:

1. H L Ahuja, *Business Economics*, S Chand Publishing, Thirteenth Edition, 2016.
2. S. P. Jainand, K.L. Narang, *Financial Accounting*, Kalyani Publishers, Twelth Edition, 2018.

REFERENCE BOOKS:

1. Joseph G. Nellis and David Parker, *Principles of Business Economics*, Pearson Education Canada, Second Edition, 2016.
2. Larry M. Walther, *Financial Accounting*, Create Space Independent Publishing Platform, 2017.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=xWKfKCnQqAE
2. https://www.youtube.com/watch?v=daYPYHbJ6Xc

WEB RESOURCES:

1. https://leverageedu.com/blog/scope-of-business-economics/
2. https://www.economicsdiscussion.net/break-even-analysis/break-even-point-of-a-firm-meaning-determination-and-types/21785

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MG101401	ESSENTIALS OF LEADERSHIP	2	-	-	-	2

Pre-Requisite

Anti-Requisite

Co-Requisite -

COURSE DESCRIPTION: This course is designed for learners who desire to improve their leadership, communications, and workplace skills.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Differentiate between leadership and management
CO2. Identify the values common among great leaders.
CO3. Discuss the power of positive expectations and how to apply it as a leader
CO4. Assess what, how, and to whom you should delegate.
CO5. Describe what it means to be an ethical leader.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	-	1	-	-	-	-	-	-
CO2	1	1	2	1	-	1	-	-	-	-	-	-
CO3	2	-	2	-	1	-	-	-	-	2	-	-
CO4	1	2	-	1	-	-	-	-	-	2	-	-
CO5	1	2	1	-	-	-	-	-	-	2	2	-
Course Correlation Mapping	**2**	**2**	**2**	**1**	**1**	**1**	**-**	**-**	-	**2**	**2**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION ***(06 Periods)***

What is leadership, leadership vs management, leadership and change, Maxwell's 5 levels of leadership, how to move to the next level

Module 2: LEADERSHIP VALUES & EXPECTATIONS ***(06 Periods)***

14 Leadership Values, what matters most exercise. Expectations, The Pygmalion Effect, impact of positive expectations, setting expectations

Module 3: DELEGATION ***(06 Periods)***

Definition, why delegate, delegate/empower, why people don't delegate, steps for delegation - the IDEALS model..

Module 4: ETHICS ***(06 Periods)***

Definitions, introduction to ethics, ethics vs morals, self-assessment, Good People, Bad Choices examples, how to be an ethical leader, 8 Ethical Actions for Leaders.

Module 5: COMMITMENT ***(06 Periods)***

Introduction, significance of commitment, Universal Laws of Leadership, tips towards being accountable and committed leader.

Total Periods:30

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. Collect the case studies related to successful leaders and their traits.
2. Different Case Studies Will be Given to students as per the topic that will be collected and evaluated.
3. The case studies will be collected as Assignments and the same will be evaluated.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Anderson T, *Transforming leadership*, St. Lucie Press, Boca Raton, FL, 2nd ed 1998
2. Babiak, P. & Hare, R.D., *Snakes in suits: when psychopaths go to work*, Regan Books, New York, 2006

REFERENCE BOOKS:

1. Conger J, *Inspiring others: Th e language of leadership,* Academy of Management Executive, 5(1), 31-45, 1991
2. *Leadership Skills*. MTD Training & Ventus Publishing ApS, 2010

VIDEO LECTURES:

1. Marshall Goldsmith: The Essentials Of Leadership (fs.blog)
2. https://onlinecourses.nptel.ac.in/noc23_mg28/preview

WEB RESOURCES:

1. cdn2.hubspot.net/hubfs/4654529/Expert landing pages/Peter Cox/Resources/10 Leadership Essentials .pdf
2. 3-leadership-essentials-discovery-event-w.-no.-05.11.12.pdf (imd.org)

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MG101402	**ORGANIZATIONAL BEHAVIOUR**	2	-	-	-	2

Pre-Requisite –

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course enables the students to know the principles in an organization, the system and process of effective controlling in the organization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Interpret the scope of organizational behaviour and its significance.

CO2. Understand the managerial strategies in achieving the organizational goals of an organization

CO3. Demonstrate the impact of motivation and leadership in group dynamics.

CO4. Solve organizational conflicts through negotiation and team building.

CO5. Improve the results – performance outcome through human behaviour and organizational behaviour can aid them in their purist of the goals.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	-	-	-	2	-	2	-	2	-	2
CO2	1	-	2	1	-	2	-	-	-	-	-	2
CO3	2	-	2	-	1	-	-	-	-	2	-	2
CO4	1	2	-	1	-	-	-	-	-	2	-	2
CO5	1	2	1	-	-	-	-	-	-	2	2	2
Course Correlation Mapping	**2**	**2**	**2**	**3**	**2**	**2**		**2**		**2**	**2**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION ***(06 Periods)***

Nature and scope – Linkages with other social sciences- Individual roles and organizational goals–perspectives of human behavior- Perception– perceptual process

Module 2: LEARNING ***(06 Periods)***

Learning - Learning Process- Theories- (Pavlov, Skinner and Thorndike) - Personality and Individual Differences -Determinants of Personality-Values, Attitudes and Beliefs.

Module 3: MOTIVATION AND LEADERSHIP ***(06 Periods)***

Definition and nature of motivation, Theories of Motivation (Maslow, Alderfer)- Leadership–Traits-Styles–Leadership skills–Challenges to leaders.

Module 4: ORGANIZATIONAL CONFLICTS ***(06 Periods)***

Causes and consequences-conflict and Negotiation Team Building, Conflict Resolution in Groups and problem solving Techniques.

Module 5: ORGANIZATIONAL COMMUNICATION ***(06 Periods)***

Communication, types and process, importance and barriers–Organizational change- change process-resistance to change–Organizational development and OD interventions.

Total Periods:30

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. Collect the case studies related to recent topics in OB and other Contemporary OB Practices and Present them as a seminar.
2. Different Case Studies Will be Given to students as per the topic that will be collected and evaluated.
3. The case studies will be collected as Assignments and the same will be evaluated.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Robbins.P.Stephen (2006),*OrganizationalBehaviou*r,PearsonEducation,NewDelhi.
2. LuthansFred(1998),*Organizational Behaviour*, Tata McGraw Hill International Edition, New Delhi.
3. K.Aswathappa, *OrganizationalBehaviou*r-*Text,Cases and Games*, Himalaya Publishing House, New Delhi, 2008.

REFERENCE BOOKS:

1. Steven McShane, Mary Ann Von Glinow, *Organizational Behaviour*, Tata McGraw Hill Higher Education, NewDelhi, 2008.
2. PareekUdai (2007), *Understanding Organizational Behaviour*, Oxford University Press, New Delhi.
3. Jerald Greenberg and Robert.A. Baron, (2009), *Organizational Behaviour*, PHI learning Private Ltd., New Delhi.

VIDEO LECTURES:

1.https://www.youtube.com/watch?v=Sg64udtQ300&list=PL3Y_ p3e- Lne2no2K5cNa8y7ti1uqCjZw8

2. https://www.youtube.com/watch?v=pHg3ZfGk5j0

WEB RESOURCES:

1. https://www.icmrindia.org
2. https://www.citeob.com/
3. https://www.ob-guide.com

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MG101403	**PROJECT MANAGEMENT**	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: To understand the importance of decision-making while implementing any project and interpret and discuss the results of qualitative and quantitative analysis

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the basic introduction to project management

CO2. Apply the methods of project identification and selection.

CO3. Understand project allocation methods and evaluation.

CO4. Analyse the techniques for project time, review, and cost

CO5. Understand the factors of risk and quality of a project.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	-	-	-	-	-	-	-	-
CO2	1	1	2	2	-		2		1			-
CO3	2	2	1	2	1	-	-	1	-	-	2	
CO4	3	1	2	2	1	-	-	-	-	-	-	2
CO5	2	2	1	2	1	1	-	-	-	-	-	1
Course Correlation Mapping	**2**	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	-	**2**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION ***(05 Periods)***

Concept of project management, project definition and key features of projects, project life cycle phases, typical project management issues, basic project activities

Module 2: PROJECT IDENTIFICATION AND SELECTION ***(06 Periods)***

Identification and screening (brainstorming, strength and weakness in the system, environmental opportunities and threats), Project evaluation methods- Payback period, Net present value, Internal rate of return and project evaluation under uncertainty.

Module 3: PROJECT RESOURCE MANAGEMENT ***(07 Periods)***

Scheduling resources, resource allocation methods, project crashing and resource leveling, working of systems, design of systems, project work system design, project execution plan, project procedure manual project control system, planning scheduling and monitoring

Module 4: TIME AND COST MANAGEMENT ***(05 Periods)***

Time Management-Network diagram, forward and backward pass, critical path, PERT and CPM, AOA and AON methods, tools for project network, Cost management-earned value method

Module 5: RISK AND QUALITY MANAGEMENT ***(07 Periods)***

Risk identification, types of risk, risk checklist, risk management tactics, risk mitigation and contingency planning, risk register, communication management, Quality assurance and quality control, quality audit, methods of enhancing quality

Total Periods: 30

EXPERIENTIAL LEARNING

1. Refer to any video lecture on project evaluation methods and give a brief seminar using PPT
2. Select any company wherein you will get the details of activities and time and draw the project network diagram and submit a report.
3.

Activity	Predecessor Activity	Normal Time (Weeks)	Crash Time (Weeks)	Normal Cost (Rs.)	Crash Cost (Rs.)
A	-	4	3	8,000	9,000
B	A	5	3	16,000	20,000
C	A	4	3	12,000	13,000
D	B	6	5	34,000	35,000
E	C	6	4	42,000	44,000
F	D	5	4	16,000	16,500
G	E	7	4	66,000	72,000
H	G	4	3	2,000	5,000

   Determine a crashing scheme for the above project so that the total project time is reduced by 3 weeks
4. Collect any case study that discusses the process of probability calculation of success of the project and submit a report

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. R.Panneerselvam and P.Senthil Kumar (2013), Project Management, PHI Learning Private Limited.
2. Prasanna Chandra (2014), Projects: Planning, Analysis, Selection, Financing, implementation, and Review.

REFERENCE BOOKS:

1. A Guide to the Project Management Body of Knowledge: (PMBOK Guide) by Project Management Institute, 2013.
2. Gopala Krishnan & Rama Murthy, A Text book of Project Management, McMillan India.
3. S. Choudhary (2004), Project Management, Tata McGraw Hill Publication.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc19_mg30/preview
2. https://archive.nptel.ac.in/courses/110/104/110104073/

WEB RESOURCES:

1. https://www.pmi.org/about/learn-about-pmi/what-is-project-management
2. https://www.manage.gov.in/studymaterial/PM.pdf
3. https://imada.sdu.dk/u/jbj/DM85/lec7.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG107601	PROFESSIONAL ETHICS AND HUMAN VALUES	2	-	-	-	2

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course deals with personal conviction, and ethics and describes the accepted principles and standards of conduct regarding moral duties and virtues as applied to an organization. Codes of professional ethics guide the stakeholders of an organization about the desirable and undesirable acts related to the profession.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the principles of ethics, professional values, and social responsibility.

CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.

CO3. Develop suitable strategies to resolve problems that arise in practicing professional ethics and Industrial standards.

CO4. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.

CO5. Provide solutions to complex problems associated with professional ethics using analysis and interpretation.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	-	-	2	2	2	2	-	-	-	1	1	1	1
CO2	2	3	2	-	2	2	2	2	2	-	-	-	1	1	1	1
CO3	2	-	3	-	2	2	2	2	2	-	-	-	1	1	1	1
CO4	2	-	-	-	-	2	2	2	2	-	3	-	1	1	1	1
CO5	2	2	3	2	-	3	2	2	2	-	-	-	1	1	1	1
Course Correlation Mapping	**2**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**-**	**3**	**-**	**1**	**1**	**1**	**1**

Correlation Levels: **3: High; 2: Medium; 1: Low**

COURSE CONTENT

Module 1: PROFESSIONAL ETHICS ***(06 Periods)***

Scope and aim of ethics, Senses of ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus, and controversy.

Module2: PROFESSIONAL IDEALS AND VIRTUES ***(06 Periods)***

Theories on virtues and ideals, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

Module 3: SOCIAL EXPERIMENTATION ***(06 Periods)***

Experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, responsible experimenters, Conscientiousness, Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards and Problems with the law of engineering.

Module 4: RESPONSIBILITIES AND RIGHTS ***(06 Periods)***

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights, and discrimination.

Module 5: HARMONY WITH PROFESSIONALETHICS ***(06 Periods)***

ceptance of human values; Ethical Human Conduct; Basis for Humanistic Education, Constitution, and Universal Order; Competence in professional ethics; Case studies: Holistic technologies, Management Models and Production Systems; Transition from the present state to Universal Human Order: socially and ecologically responsible engineers, technologists and managers - enriching institutions and organizations.

Total Periods: 30

EXPERIENTIAL LEARNING

1. emonstrate orally using your experiences of what is naturally acceptable in a relationship – Feeling of respect or disrespect and what is naturally acceptable is to nurture or exploit others.
2. entify community partners and discuss with a community partner or organization. Prepare a report by identifying and analysing the issues or opportunities.
3. eld experiences may be directed to include a range of time-intensive endeavours that require varying levels of student interaction. Prepare a report on visiting a Juvenile home.
4. udents read a speech in the classroom by former United Nations Secretary-General Kofi Annan on human values.
5. udents are encouraged to bring a daily newspaper to class or to access any news related to the need for human values and note down the points.
6. ing out the relevance of engineering ethics theory and practice with relevance to current trends.
7. ofessional ideals and virtues are important to everyone. Prepare a case study on the professional ideals and virtue of any one of the famous sports personalities from India.
8. mpare the present to the past in engineering experimentations concerning the change in professionalism.
9. ake a study on occupational crime and the role of modern technology in finding solutions.
10. epare a case study on how to maintain harmony with different cultural people using professional ethics.

(It's an indicative one. The course instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXTBOOKS:

1. Gaur R R, Sangal R & G P Bagaria, *Human Values and Professional Ethics*,Excel Books, New Delhi, 2010.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthilkumar, V. S., *Engineering Ethics*, Prentice Hall of India, 2004.
3. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd Edition, 2007.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001.
3. Charles F. Fledderman, *Engineering Ethics*, Pearson Education, 2nd Edition, 2004.
4. R. Subramanaian, *Professional Ethics*, Oxford Higher Education, 2013.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=jfGIq_EiXzI
2. https://www.youtube.com/watch?v=QFHOtH54oUc
3. https://www.youtube.com/watch?v=JJshY11nX14
4. https://www.youtube.com/watch?v=TyP09S0UEzA
5. https://www.youtube.com/watch?v=0QMwjV_ZVtc

WEB RESOURCES:

1. https://siiet.ac.in/wp-content/uploads/2020/09/7.1.10-professional-ethics-manual.pdf
2. https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values%20by%20R.S%20NAAGARAZAN.pdf
3. https://india.oup.com/productPage/5591038/7421214/9780199475070

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CE107601	**ENVIRONMENTAL SCIENCE**	2	-	-	-	2

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on natural resources, ecosystems, biodiversity, environment pollution and control, social issues and environment, human population and environment.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze natural resources to solve complex environmental problems and natural resource management considering society, environment and sustainability.

CO2. Analyze ecosystems and biodiversity to solve complex environmental problems by following environmental ethics considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze various types of pollution and their control measures to solve environmental problems through appropriate tools and techniques following latest developments considering society, ethics, environment and sustainability.

CO4. Analyze social issues and its impact on environment, environmental acts to solve complex environmental problems considering society, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze human population and its impact on environment to solve complex environmental problems through team work and using appropriate tools and techniques considering ethics, society, environment and sustainability.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	1	1	-	-	-	1	-
CO2	3	3	-	2	-	1	1	1	-	1	-	-
CO3	3	3	-	2	1	1	1	1	-	-	-	1
CO4	3	3	-	3	-	1	1	1	-	1	-	-
CO5	3	3	-	2	1	1	1	1	1	-	-	-
Course Correlation Mapping	**3**	**3**	**-**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: NATURAL RESOURCES ***(07 Periods)***

Multidisciplinary nature of environment; Natural Resources: Renewable and non-renewable resources; Forest, Water, Mineral, Food and Energy resources -Causes, Effects, Remedies, Case studies; Role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

Module 2: ECOSYSTEMS AND BIODIVERSITY ***(07 Periods)***

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem - Producers, Consumers, Decomposers; Food chains, Food webs, Ecological pyramids – Types; Characteristic features, Structure and functions of forest ecosystem, Desert ecosystem, Aquatic ecosystem.

Biodiversity: Concept and value of biodiversity, Role of biodiversity in addressing new millennium challenges, Hot spots of biodiversity, Threats to biodiversity, Man-wild life conflicts, Endemic, Endangered and extinct species of India, Conservation of biodiversity – In-situ and ex-situ.

Module 3: ENVIRONMENTAL POLLUTION AND CONTROL ***(06 Periods)***

Causes, Adverse effects and control measures of pollution - Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution, Solid waste management – Urban waste, industrial waste; Latest developments in pollution control, Hazards and disaster management – Floods, Earthquakes, Tsunamis, Case studies.

Module 4: SOCIAL ISSUES AND THE ENVIRONMENT ***(06 Periods)***

Sustainable development, Urban problems related to energy, Environmental ethics –Issues, Solutions; Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and case studies, Wasteland reclamation, Consumerism and waste products, Concept of green technologies, Environment justice: National Green Tribunal and its importance; Environment protection act, Air act, Water act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation, Public environmental awareness.

Module 5: HUMAN POPULATION AND THE ENVIRONMENT ***(04 Periods)***

Population growth, Population characteristics and variation among nations, Population explosion, Family welfare programme, Environment and human health, Human rights, Value education, HIV/AIDS, Women and child welfare, Role of information technology in environment and human health; Case studies - Field Work/Assignment/Seminar on Environmental assets – Water bodies/Forest/Grassland/Hill/Mountain.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Visit a nearby villages and know the status of availability of local resources that can be improved through proper education.
2. Make an awareness program in the villages for the development of natural resources, ecosystems and biodiversity.
3. Prepare a document by visiting a local urban waste dumping yard near to the Tirupati city.
4. Visit a local village and find a barren land and make the land into a useful land by planting plants or providing the soil and fertilizers required to improve the soil.
5. Visit a local zoological park and identify the species variety and variability.

(It's an indicative one. The course instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. Anubha Kaushik and Kaushik, C.P., *Perspectives in Environmental Studies*, New Age International (P) Ltd. Publications, 6th Edition, 2018.
2. ErachBarucha, *Environmental Studies,* Orient Blackswan, 3rd Edition, 2021.

REFERENCE BOOKS:

1. Cunningham, W. P. and Cunningham, M. A., *Principles of Environmental Science*, Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition, 2016.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2nd Edition, 2009.
3. Anji Reddy, M., *Text Book of Environmental Science and Technology*, BS Publications, Revised Edition, 2014.
4. Rajagopalan, R., *Environmental Studies*, Oxford University Press, 3rd Edition, 2015.

VIDEO LECTURES:

1. http://nptel.ac.in/courses/109/104/109104047
2. https://www.youtube.com/watch?v=mIPBPG-5dUw

WEB RESOURCES:

1. https://nptel.ac.in/courses/122102006
2. https://www.flame.edu.in/academics/ug/program-structure/major-minor courses/environmental-studies
3. https://www.tutorialspoint.com/environmental_studies/environmental_studies_env ironment.htm

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CE107602	DISASTER MITIGATION AND MANAGEMENT	2	-	-	-	2

Pre-Requisite -

Anti-Requisite –

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion ondisasters, earthquakes, floods, cyclones, droughts, landslides and disaster management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the vulnerability of an area to natural and man-made disasters/hazards as per the guidelines to solve complex problems using appropriate techniques ensuring safety, environment and sustainability.

CO2. Propose appropriate mitigation strategies for earthquake and tsunami impacts as per code of practice using suitable techniques ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze the causes and impacts of floods, cyclones and droughts using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze the causes and impacts of landslides using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability.

CO5. Design disaster management strategies to solve pre, during and post disaster problems using appropriate tools and techniques following the relevant guidelines and latest developments ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	2	2	2	2	-	-	-	-
CO2	3	3	3	3	2	2	1	2	-	2	-	-
CO3	3	3	-	2	2	2	2	-	-	2	-	-
CO4	3	3	-	3	2	2	2	-	-	-	-	-
CO5	3	2	3	2	2	2	1	2	-	1	3	2
Course Correlation Mapping	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**-**	**2**	**3**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: DISASTERS ***(06 Periods)***

Types of disasters - Natural disasters; Impact of disasters on environment, infrastructure and development; Concepts of hazards and vulnerability analysis, Hazard Assessment, Guidelines for hazard assessment and vulnerability analysis, Basic principles and elements of disaster mitigation.

Module 2: EARTHQUAKES ***(06 Periods)***

Introduction to earthquake, Intensity scale (MSK–64), Seismic zones and activity in India, Action plan for earthquake disaster preparedness, Elements at risk, Recovery and rehabilitation after earthquake, Concepts of Earthquake resistant design and construction of buildings; Tsunami – Onset, Types and causes,Warning, Elements at risk, Typical effects, Specific preparedness and mitigation strategies, Case studies.

Module 3: FLOODS, CYCLONES AND DROUGHTS ***(07 Periods)***

Floods and Cyclones: Onset, Types, Causes, Warnings, Elements at risk, Typical effects, Indian floods and cyclones, Hazard zones, Potential for reducing hazards, Mitigation strategies and community based mitigation, Case studies.

Droughts: Onset, Types and warning; Causes, Impact, Early warning and response mechanisms, Mitigation strategies, Droughts in India, Case studies.

Module 4: LANDSLIDES ***(06 Periods)***

Onset, Types and warning; Causes, Elements at risk, Indian landslides, Hazards zones, Typical effects, Mitigation strategies and community based mitigation, Case studies.

Module 5: DISASTER MANAGEMENT ***(05 Periods)***

Disaster management organization and methodology, Disaster management cycle, Disaster management in India – Typical cases and Cost–benefit analysis, Disaster management programs implemented by NGOs and Government of India, Usage of GIS and Remote sensing techniques in disaster management, Leadership and Coordination in Disaster management, Emerging trends in disaster management.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Perform hazard assessment and vulnerability analysis for any nearby town/city and prepare a detailed report of possible impacts of various disasters on environment, infrastructure and development.
2. Prepare a detailed report on the causes and effects of Tsunami that was occurred in the year 2004. Also discuss various advancements in Tsunami warning systems.
3. Identify the major causes of urban floods in cities like Chennai, Hyderabad & Mumbai and submit a report along with various mitigation strategies to reduce the impact of floods.
4. Prepare a detailed report on how various man-made activities are directly/indirectly related to the occurrence of landslides that occurred in recent days in India.
5. Visit AP State Disaster Response and Fire Services Department and record about various methods used by them in mitigating disasters and their management.

RESOURCES

TEXT BOOKS:

1. Sharma V. K., *Disaster Management,* Medtech Publishing, 2nd Edition, 2013.
2. Anand S. Arya, AnupKaranth, and Ankush Agarwal, *Hazards, Disasters and Your Community: A Primer for Parliamentarians*, GOI–UNDP Disaster Risk Management Programme, Government of India, National Disaster Management Division, Ministry of Home Affairs, New Delhi, Version 1.0, 2005

REFERENCE BOOKS:

1. Donald Hyndman and David Hyndman, *Natural Hazardsand Disasters*, Cengage Learning, USA, 5th Edition,2015.
2. *Disaster Management in India,*A Status Report, Ministry of Home Affairs, Govt. of India, May 2011.
3. Rajendra Kumar Bhandari, *Disaster Education and Management: A Joyride for Students, Teachers, and Disaster Managers*, Springer India, 2014.
4. Singh R. B., *Natural Hazards and Disaster Management*, Rawat Publications, 2009.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/105104183
2. https://www.digimat.in/nptel/courses/video/124107010/L01.html

WEB RESOURCES:

1. https://egyankosh.ac.in/handle/123456789/25093
2. https://www.egyankosh.ac.in/handle/123456789/25912
3. https://www.nios.ac.in/media/documents/333courseE/12.pdf
4. https://ndmindia.mha.gov.in/images/public-awareness/Primer%20for%20Parliamentarians.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CE107603	**RURAL TECHNOLOGY**	2	-	-	-	2

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on technology for rural development, nonconventional energy, technologies for rural development, community development and it in rural development.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Compare various technologies for rural development by solving rural problems through different schemes by considering ethics, society, environment and sustainability.

CO2. Analyze non conventional energy sources using appropriate tools and techniques to solve rural energy problems considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Select appropriate technologies in different areas of rural development to solve rural issues following latest developments considering society, environment and sustainability.

CO4. elate water conservation, health, safety and rural employment issues for community development to solve rural problems through appropriate technologies considering ethics, society, environment and sustainability.

CO5. Analyze the impact of IT, public and private partnership on rural development to solve complex rural problems using appropriate tools and techniques considering ethics, society, environment and sustainability.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	-	3	2	1	1	1	-	-	-	-
CO2	2	3	-	2	2	1	1	-	-	1	-	-
CO3	2	3	-	2	2	1	1	-	-	-	-	1
CO4	2	3	-	2	2	1	2	1	-	-	-	-
CO5	2	3	-	3	2	1	1	1	-	-	-	-
Course Correlation Mapping	**2**	**3**	**-**	**3**	**2**	**1**	**2**	**1**	-	**1**	**-**	**1**

Correlation Levels: **3: High;** **2: Medium;** **1: Low**

COURSE CONTENT

Module 1: INTRODUCTION TO RURAL DEVLOPMENT ***(06 Periods)***

India - Technology and rural development, Pre and post-independence period, Rural India Life, Indian farmer, Role of science and technology in rural development, Rural technology and poverty eradication, Rural business hubs, Technology in improving rural infrastructure, Various organizations related to innovation, Issues of technology transfer - CAPART, NABARD, CSIR, NIF.

Module 2: NON CONVENTIONAL ENERGY ***(06 Periods)***

Definition of energy, Types of alternative sources of energy, Sources of non-conventional energy – Solar energy: Solar pump in agriculture, Solar dryer, Solar cooker, Solar heater; Biogas, Recycling and management, Wastes conservation, Assessment and production of biomass products and their utilization.

Module 3 TECHNOLOGIES FOR RURAL DEVELOPMENT ***(06 Periods)***

Food and agro based technologies, Tissue culture, Nursery, Building and construction technologies, Cultivation and processing of economic plants, Cottage and social industries, Latest developments in rural technologies.

Module 4 COMMUNITY DEVELOPMENT ***(06 Periods)***

Water conservation, Rain water Harvesting, Drinking water Standards and simple treatments used, Environment and Sanitation, Bio fertilizers, Medical and aromatic plants, Employment generating technologies–Apiculture, Pisciculture, Aquaculture.

Module 5 IT IN RURAL DEVELOPMENT ***(06 Periods)***

Role of information technology (IT) in rural areas, Impact of IT in rural development, Need and necessity of technology, Corporate social responsibilities, Private sector participation (Activities in different spheres: Employment, Education, Health, Agriculture and service sectors) and Saansad Adarsh Gram Yojana (SAGY), Village adoption schemes.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Visit a nearby village and know the status of small scale industries which are implanted and to be established based on the availability of the local resources.
2. Visit a local village and make an awareness program on energy utilization using biomass products.
3. Make a awareness program in the villages for the rural development in terms of home-made products.
4. Construct rain water harvesting structures in nearby villages where water scarcity is more and prepare a document.
5. Develop a small IT application the village area which will be used for the growth of the village.

(It's an indicative one. The course instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. Virdi, M. S., *Sustainable Rural Technologies*, Daya Publishing House, 2nd Edition 2018.
2. Prabhath, S. V. and P. Ch. Sita Devi, *Technology and Rural India*, Serials Publications, 1st Edition, 2012

REFERENCE BOOKS:

1. Chakravarthy, R., and Murthy, P. R. S., *Information Technology and Rural Development*, Pacific Book International, 1st Edition, 2012.
2. Shivakanth Singh, *Rural Development Policies and Programmes*, Northern Book Centre, 1st Edition, 2002.
3. Katar Singh, and Anil Shishodia*, Rural Development: Principles, Policies, and Management,* SAGE Publications India Private Limited, 4th Edition, 2016.
4. Vinayak Reddy, A. and YadagiraCharyulu, M., *Rural Development in India: Policies & Initiatives,* New Century Publications, 1st Edition, 2008.

VIDEO LECTURES:

1. http://nptel.ac.in/courses/109/104/109104047
2. https://www.youtube.com/channel/UCEZxAQu3ZBulN-pYMYO2i_A/videos
3. https://www.youtube.com/watch?v=HnrIB-QmvlQ

WEB RESOURCES:

1. en.wikibooks.org/wiki/Technologies_for_Rural_Development/Complete
2. https://www.oecd-ilibrary.org/sites/ae6bf9cd-en/index.html?itemId=/content/component/ae6bf9cd-en
3. https://crdt.iitd.ac.in/

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG107603	**SPOKEN ENGLISH**	-	1	2	-	2

Pre-Requisite - 22LG102401 - English for Professionals

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course deals with the development of fluency and intelligibility in spoken English. Through individual and group activities, students work on improving pronunciation, practicing conversation strategies, and delivering oral presentations.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge of functional English for effective communication.

CO2. Analyze different types of vocabulary for fluency in communication

CO3. Apply correct usage of English grammar in writing and speaking.

CO4. Apply speaking strategies in terms of usage of English with accuracy, appropriacy, and fluency.

CO5. Analyze techniques to use communication skills for effective presentation.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	2	-	3	-	-	-
CO2	2	3	-	-	-	-	2	-	3	-	-	-
CO3	2	-	3	-	3	-	2	-	3	-	-	-
CO4	2	-	-	-	3	-	2	-	3	-	-	-
CO5	2	3	2	-	3	-	2	-	3	-	-	-
Course Correlation Mapping	**2**	**3**	**3**	**-**	**3**	**-**	**2**	**-**	**3**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: FUNCTIONAL ENGLISH ***(06 Periods)***

Concepts of Functional Spoken English, Self-Introduction; Listening and Speaking: Do's and Don'ts; Expressions: Ability, Admiration, Agreement, Annoyance, Appreciation, Pleasure, Sarcasm, Satisfaction, Surprise, Approval, Certainty, Doubt, Gratitude, Possibility, Fear, Worry, Condolences; Asking for: Advice, Clarification, Direction, Information, Permission; Making: Predictions, recommendations

Module 2: VOCABULARY BUILDING ***(06 Periods)***

Vocabulary for day-to-day conversations: Vegetables, Groceries, Fruits, Weather, Parts of a Human body, Dresses, Furniture; Relations: Birds, Cries of Animals, Food, Hospitality, Houses, Rooms, Tools, Airport, News Paper, Books, Gems, Corporate Vocabulary, Jobs, Occupations, Diseases; British and American spelling; Slang Words and Technical Jargons.

Module 3: FUNCTIONAL GRAMMAR - I ***(06 Periods)***

English Grammar and the Indian Student, Parts of Speech, Verb forms: Tenses, Voice and Speech.

Module 4: FUNCTIONAL GRAMMAR -II ***(06 Periods)***

Universal Auxiliaries: Sentence Structure, WH Questions, framing of Questions with answers; Question Tags, Subject and verb agreement, Spotting Errors.

Module 5: COMMUNICATION SKILLS: ***(06 Periods)***

Polite, Courteous and diplomatic expressions, Good manners and Etiquette, Conversation Techniques, Narrating Stories.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Critically analyse the value of Indian money and its impact on the common man and Prepare a PowerPoint Presentation.
2. Prepare a conversation between you and a sanitary officer regarding sanitary conditions in your locality.
3. The English Language has a rich vocabulary and it increases day by day. Present a seminar on the norms adhered to in adding new words and list out the words added in the last five years with their meaning.
4. Enact roleplays in different situations.
5. Participate in group discussions and debate on present issues
6. A conversation is an exchange of ideas, thoughts, and feelings between two or more persons. Explain it with suitable examples
7. Prepare a schedule and identify various committees to be formed for celebrating the Annual Day of a college and explain team involvement in the celebration.
8. Gather various ideas on discussing with parents the role of higher education and job opportunities.
9. Imagine you see a person wasting water. Write a dialogue objecting to such wastage of natural resources.
10. Since social media offers a wide reach easily, it becomes easier for bullies to spread gossip or issue threats. How do you think Cybercrime is a menace brought about by social media?

SCHOOL CORE

Course Code	Course Title	L T P S C
22LG107602	**ESSENTIAL LIFE SKILLS FOR HOLISTIC DEVELOPMENT**	**2 - - - 2**

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course deals with the enhancement of employability skills and maximizes the potential by introducing the principles that are for personal and professional success, and helping to apply them in their lives and careers.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate life skills required in personal and professional life.
CO2. Analyze well-defined techniques to cope with emotions and stress.
CO3. Apply appropriate thinking and problem-solving methods to solve problems.
CO4. Function effectively in a team and as an individual.
CO5. Demonstrate the qualities of an effective leader.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	2	-	2	-	-	-
CO2	2	3	-	-	2	-	2	-	2	-	-	-
CO3	2	3	2	-	-	-	2	-	2	-	-	-
CO4	2	2	-	-	2	-	2	-	2	-	3	-
CO5	2	2	-	-	-	-	2	-	2	-	-	-
Course Correlation Mapping	**2**	**3**	**2**	**-**	**2**	**-**	**2**	**-**	**2**	**-**	**3**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: OVERVIEW OF LIFE SKILLS ***(06 Periods)***

Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem-solving, Effective Communication, interpersonal relationships, coping with stress, coping with emotion.
Ethics, Moral & Professional Values: Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.

Module 2: STRESS MANAGEMENT ***(06 Periods)***

Stress Management: Stress, reasons, and effects, identifying stress, stress diaries, the four A's of stress management, techniques, **Approaches**: action-oriented, emotion-oriented, acceptance oriented, resilience, Gratitude Training, **Coping with emotions**: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method, and relaxation techniques.

Module 3: TRANSFORMATIONAL SKILLS ***(06 Periods)***

Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Functions of Left

Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.

Module 4: GROUP AND TEAM DYNAMICS ***(06 Periods)***

Introduction to Groups: formation of the group, thinking strategies, Clarifying expectations, Problem Solving, Consensus, Dynamic techniques, Group vs Team, Team Dynamics, and Virtual Teams. Managing team performance and managing conflicts, Intrapreneurship.

Module 5: LEADERSHIP ***(06 Periods)***

Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, managing diverse stakeholders, crisis management. Types of Leadership, Traits, Styles, VUCA Leadership, Levels of Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Prepare an attitude test by making small groups in the class and measure the attitudes of students in your class.
2. Students are psychologically pressurized for qualifying in campus interviews. Prepare a Case study on the Campus Interview pressure and stress of students using SWOT analysis.
3. Record and prepare a video presentation on people of different cultures and make a comment on their accents.
4. The qualities of the leaders play an important role in their success. Prepare a short film about a leader and list out the best qualities.
5. In the present context, social media plays a vital role in the success of leaders and the wide spread of their principles. Prepare a presentation on the impact of social media on a success of a leader.
6. 'Knowledge of present technologies helps us to live a harmonious life.'
   Make a video to justify the statement.
7. Prepare a PowerPoint presentation on life skills needed in our day-to-day life and their importance.
8. Every person wants to be successful in their personal and professional life and apply various strategies for that. List out the strategies to become successful in one's professional life.
9. A boy/girl who is a neighbour feels depressed for not being given with mobile for playing video games. Find methods and solutions to overcome the self-pity of the boy/girl.
10. Identify the persons who are irregular to class. Find out their problems and come up with solutions.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Dr.K Alex*, Soft Skills*, S Chand & Company Pvt.Ltd.2013.
2. Monmohan Joshi, *Soft Skills. Boolkboon.com*, 1st Edition, 2017.

REFERENCE BOOKS:

1. Agna Fernandez, *Generic Skills for Employability*, Cambridge University Press, 2020.
2. Larry James, *The First Book of Life Skills*, Embassy Books, 1st edition, 2016.

3. Shiv Khera, *You Can Win*, Macmillan Books, New York, 2003.

4. Barun K. Mitra, *Personality Development & Soft Skills*, Oxford Publishers, 3rdimpression, 2017.

5. ICT Academy of Kerala, *Life Skills for Engineers*, McGraw Hill Education (India) Private Ltd., 2016.

6. David R. Caruso, *The Emotionally Intelligent Manager How to Develop and Use the Four Key Emotional Skills of Leadership*, John Wiley & Sons, 2004.

7. Kalyana, *Soft Skill for Managers*, Wiley Publishing Ltd, 1st edition, 2015.

8. Larry James, *The First Book of Life Skills*, Embassy Books, 1st edition, 2016.

9. ShaliniVerma, *Development of Life Skills and Professional Practice*, Sultan Chand (G/L) & Company, 1st edition, 2014.

10. Daniel Goleman, *Emotional Intelligence*, Bantam, 2006.

11. Remesh S., Vishnu R.G., *Life Skills for Engineers*, Ridhima Publications, 1st edition, 2016.

12. Butterfield Jeff, *Soft Skills for Everyone*, Cengage Learning India Pvt Ltd, 1st edition, 2011.

13. *Training in Interpersonal Skills: Tips for Managing People at Work*, Pearson Education, India, 6th edition, 2015.

14. *The Ace of Soft Skills: Attitude, Communication and Etiquette for Success*, Pearson Education, 1st edition, 2013.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=xM0fajUl7Bg
2. https://www.youtube.com/watch?v=HwLK9dBQn0g
3. https://www.youtube.com/watch?v=sxX5LoojdJw
4. https://www.youtube.com/watch?v=xJBgqW9-lzc
5. https://www.youtube.com/watch?v=QVwTVM1Iv1c

WEB RESOURCES:

1. https://www.clarke.edu/campus-life/health-wellness/counseling/articles-advice/developing-a-positive-attitude/
2. https://www.skillsyouneed.com/ps/personal-swot-analysis.html
3. https://ecampusontario.pressbooks.pub/profcommsontario/chapter/cross-cultural-communication/
4. https://thepeakperformancecenter.com/educational-learning/thinking/#:~:text=There%20are%20several%20core%20thinking,storing%20and%20then%20retrieving%20information.
5. https://www.webmd.com/anxiety-panic/guide/stage-fright-performance-anxiety

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MG107601	**INNOVATION, INCUBATION, AND ENTREPRENEURSHIP**	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: To course sensitize students on the prospects, opportunities, and challenges in entrepreneurship and the potential for value creation from prospective idea

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the basics of generating new business ideas

CO2. Explain the concept of design thinking and product innovation.

CO3. Illustrate the roles of digital technology in entrepreneurship.

CO4. Understand the need for startup economics and market conditions

CO5. Evaluate the reasons for successful entrepreneurship.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	-	-	-	-	-	-	-	-
CO2	1	1	1	-	-	-	-		1			-
CO3	2	2	1	-	-	-	-	1	-	-	2	
CO4	3	1	1	-	-	-	-	-	-	-	-	1
CO5	2	2	-	-	-	1	-	-	-	-	-	1
Course Correlation Mapping	**2**	**2**	**1**	**1**	**-**	**1**	**-**	**1**	1	**-**	**2**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION ***(06 Periods)***

Concept & Definition, Taking product or service ideas to creating value: Why should one choose to become an entrepreneur, Entrepreneurial mind-set, Intrapreneurship

Module 2: PRODUCT INNOVATION ***(06 Periods)***

Product innovation process, engineering design process and the concept of frugal engineering for developing innovative affordable products, effective user-interface.

Module 3: DIGITAL TECHNOLOGY ENTREPRENEURSHIP ***(06 Periods)***

Industry 4.0 landscape and innovations using digital technologies like AI, IOT, AR/VR, Cloud, SAAS, User Applications.

Module 4: STARTUP ECONOMICS & MARKET CONSIDERATIONS ***(06 Periods)***

Economic consideration for starting a venture, Understanding Feasibility analysis, Understanding market, targeting customer and positioning product

Module 5: SUCCESSFUL BUSINESS INCUBATION ***(06 Periods)***

Business model innovation, Business process management , competitive advantages, Business model canvas, Bootstrapping.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Create and present a prototype of a new product of your choice.
2. Present at least three cases of successful business Ideas in recent times
3. Discuss in the group Entrepreneurship opportunities in terms of Orientation and Develop mentation.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Robert D. Hisrich, *Entrepreneurship,*
2. Kuratko&Hodgetts, *Entrepreneurship- Theory, Process & Practice*, Thompson South-Western Publication

REFERENCE BOOKS:

1. Peter Drucker, *Innovation and Entrepreneurship*, Harper Collins
2. Thomas N. Duening, Robert D. Hisrich and Michael A. Lechter, *Technology Entrepreneurship Taking Innovation to the Marketplace*, Elsevier
3. Prof. Nigel Cross, *Bloomsbury Design Thinking Understanding How Designers Think and Work*, 2019 Edition

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc21_mg63/preview
2. https://onlinecourses.nptel.ac.in/noc22_de08/preview

WEB RESOURCES:

1. https://ciie.iitism.ac.in/files/CIIE-POLICY.pdf
2. https://www.nios.ac.in/media/documents/249_Enterpreneurship/English_pdf/249_Enterpreneurship_Lesson_16.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22EE107601	**INTELLECTUAL PROPERTY RIGHTS**	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: The course is designed to provide comprehensive knowledge to the students regarding the general principles of intellectual property rights, Concept and Theories, Criticisms of Intellectual Property Rights, International Regime Relating to IPR. The course provides an awareness on how to protect ones unique creation, claim ownership, knowledge of what falls under the purview of someone's rights and what doesn't, and safeguard their creations and gain a competitive edge over the peers.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the need and the concepts of intellectual property right and avenues for filling intellectual property rights.

CO2. Understand the legislative practices and protocols for acquisition of trademark and the judicial consequences for violating laws of trademark protection.

CO3. Understand the legislative practices and protocols for acquisition of copyrights and the judicial consequences for violating laws of copyrights protection.

CO4. Understand the fundamentals of patent laws, legislative practices and protocols for acquisition of trade secrets and the judicial consequences for violating laws of trade secrets protection.

CO5. Understand the importance of geographical indications and various laws and protocols for protecting geographical indications.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	-	2
CO2	3	-	-	-	1	-	-	3	-	-	-	2
CO3	3	-	-	-	1	-	-	3	-	-	-	2
CO4	3	-	-	-	1	-	-	3	-	-	-	2
CO5	3	-	-	-	1	-	-	3	-	-	-	2
Course Correlation Level	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**2**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS ***(06 Periods)***

Introduction and the need for intellectual property rights (IPR); types of intellectual property- Design; International organizations, agencies and treaties.

Module 2: TRADEMARKS ***(06 Periods)***

Introduction to trademark, Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

Module 3: LAW OF COPYRIGHTS ***(06 Periods)***

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

Module 4: TRADE SECRETS ***(06 Periods)***

Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.
Unfair competition: Misappropriation right of publicity, false advertising.

Module 5: GEOGRAPHICAL INDICATIONS ***(06 Periods)***

The Geographical indications law in India, The objectives and features, the registry of geographical indications powers and functions. Types of goods offered. Protection: Agriculture goods, manufactured goods and natural goods. Registration of indications and the requirements. Prohibition of misleading use of indications of geographical origins, prohibition of dilution of geographical origins.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Should conduct a survey based on the real scenario, where IPR is misused or unethically used and present an article.
2. Prepare an article on the registration processes of IPR practically (copy right/trade mark/ patents).
3. Should study a case of conflict on trademarks/patents and should produce an article mentioning the circumstances and remedial measures.
4. Prepare an article on the latest development in the international intellectual property rights.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

TEXT BOOKS:

1. Deborah, E. Bouchoux, *Intellectual property: The law of Trademarks, Copyright, Patents, and Trade Secrets,* Cengage learning, 4th Edition, 2013.
2. PrabuddhaGanguli, *Intellectual property right - Unleashing the knowledge economy*, Tata McGraw Hill Publishing Company Ltd.
3. Marsha AEchols,*Geographical Indications for Food Products*, Wolters, 2008

REFERENCE BOOKS:

1. Neeraj P., &Khusdeep D., *Intellectual Property Rights,* PHI learning Private Limited, 1st Edition, 2019.
2. Nithyananda, K V., *Intellectual Property Rights: Protection and Management,* Cengage Learning India Private Limited, 2019.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/110105139

WEB RESOURCES:

1. Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf
2. World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf
3. Cell for IPR Promotion and Management (http://cipam.gov.in/)
4. World Intellectual Property Organisation (https://www.wipo.int/about-ip/en/)
5. Office of the Controller General of Patents, Designs & Trademarks (http://www.ipindia.nic.in/)

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22EE107602	FUNDAMENTALS OF RESEARCH METHODOLOGY	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: The course is developed for the students' to understand the underlying concepts of research methodology and a systematic approach for carrying out research in the domain of interest. The course is emphasised on developing skills to recognise and reflect the strength and limitation of different types of research; data collection methods, methods of Processing and analysing data. The course also emphasises on interpreting the findings and research articulating skills.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understands the underlying concepts of research methodology, types of research and the systematic research process.

CO2. Understand the philosophy of research design, types of research design and develop skills for a good research design.

CO3. Understand the philosophy of formulation of research problem, methods of data collection, review of literature and formulation of working hypothesis.

CO4. Understand various data processing and analysing techniques and their significance in research.

CO5. Develop skills to interpret the findings and research articulating skills along with the ethics of research.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	1	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	2	1	-	-	-	-	-	-
CO4	3	2	-	-	3	1	-	-	-	-	-	-
CO5	3	-	-	-	-	--	-	-	3	3	-	-
Course Correlation Level	**3**	**2**	**1**	**-**	**3**	**1**	**-**	**-**	**3**	**3**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION TO RESEARCH METHODOLOGY ***(06 Periods)***

Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research and Scientific Method, Research Process, Criteria of Good Research.

Module 2: RESEARCH DESIGN ***(06 Periods)***

Research design—Basic Principles, Need of research design, Features of good design, Important concepts relating to research design, Different research designs, Basic principles of experimental designs, Developing a research plan.

Module 3: RESEARCH FORMULATION ***(06 Periods)***

Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Data collection – Primary and secondary sources; Critical literature review – Identifying gap areas from literature review, Development of working hypothesis.

Module 4: PROCESSING AND ANALYSIS OF DATA ***(06 Periods)***

Processing Operations, Elements/Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Relationship, Simple Regression Analysis.

Module 5: INTERPRETATION AND REPORT WRITING ***(06 Periods)***

Interpretation*:* Meaning of interpretation; Techniques of interpretation; Precautions in Interpretation.

Report Writing: Significance, Different Steps, Layout, Types of reports, Mechanics of Writing a Research Report, Precautions in Writing Reports.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Should conduct a survey based on a hypothesis, analyze the data collected and draw the inferences from the data.
2. Should review the literature on the given topic and should identify the scope/gaps in the literature and develop a research hypothesis.
3. Should study a case, formulate the hypothesis and identify an appropriate testing technique for the hypothesis.
4. Study an article and submit a report on the inferences and should interpret the findings of the article.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. C.R. Kothari, *Research Methodology: Methods and Techniques*, New Age International Publishers, 2nd revised edition, New Delhi, 2004.
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., *An introduction to Research Methodology*, RBSA Publishers, 2002.

REFERENCE BOOKS:

1. R. Panneerselvam, *Research Methodology*, PHI learning Pvt. Ltd., 2009.
2. Singh, Yogesh Kumar, *Fundamental of research methodology and statistics*, New Age International, 2006.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/121106007
2. https://onlinecourses.nptel.ac.in/noc22_ge08/preview
3. https://www.youtube.com/watch?v=VK-rnA3-41c

WEB RESOURCES:

1. https://www.scribbr.com/category/methodology/
2. https://leverageedu.com/blog/research-design/
3. https://prothesiswriter.com/blog/how-to-formulate-research-problem
4. https://www.formpl.us/blog/hypothesis-testing
5. https://www.datapine.com/blog/data-interpretation-methods-benefits-problems/
6. https://leverageedu.com/blog/report-writing/

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22AI101001	**DISCRETE MATHEMATICAL STRUCTURES**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on discrete mathematics to make students to think logically and mathematically and apply these techniques in solving problems. Topics include mathematical logic, functions, relations, deterministic algorithms and analysis techniques based on counting methods, recurrence relations, trees and graphs.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply mathematical logic and truth tables to validate precise statements.
CO2. Understand the concepts of sets, relations and functions.
CO3. Analyze and apply the concepts of mathematical induction, counting principles and properties of algebraic structures to solve computational Problems.
CO4. Formulate problems and solve recurrence relations using substitution method and generating functions.
CO5. Apply trees and graphs to solve the problems in computer applications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	2	2	-	-	-	-	-	-	-	3	-	-	-
CO2	3	-	-	2	2	-	-	-	-	-	-	-	3	-	-	-
CO3	3	3	-	3	2	-	-	-	-	-	-	-	3	-	-	-
CO4	3	2	-	3	2	-	-	-	-	-	-	-	3	-	-	-
CO5	3	-	-	3	2	-	-	-	-	-	-	-	3	-	-	-
Course Correlation Mapping	**3**	**3**	-	**2**	**2**	-	-	-	-	-	-	-	**3**	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: MATHEMATICAL LOGIC AND NORMAL FORMS ***(08 Periods)***

Mathematical Logic: Introduction, Statements and Notation, Connectives, Well- formed formulae, Truth tables, Tautology, Equivalence, Implications.
Normal forms: Disjunctive normal form, Conjunctive normal form, Principle disjunctive normal form, Principle conjunctive normal form.

Module 2: RELATIONS AND FUNCTIONS ***(08 Periods)***

Relations: Cartesian product of sets, Relations, Properties of binary relations, Equivalence, Compatibility and Partial ordering relations, Hasse diagram and related applications, Lattices as partially ordered sets, Definition and examples, Properties of Lattices.
Functions: Types of functions, Composition of functions and inverse of functions

Module 3: INDUCTION, COUNTING AND ALGEBRAIC STRUCTURES ***(09 Periods)***

Induction, Counting: Mathematical Induction – The Basics of Counting - The Pigeonhole Principle - Principle of Inclusion-Exclusion.

Algebraic Structures: Algebraic systems, Examples and general properties, Semi groups and Monoids, Groups, Subgroups, Homomorphism, Isomorphism
Induction, Counting: Mathematical Induction – The Basics of Counting - The Pigeonhole Principle - Principle of Inclusion-Exclusion.
Algebraic Structures: Algebraic systems, Examples and general properties, Semi groups and Monoids, Groups, Subgroups, Homomorphism, Isomorphism

Module 4: GENERATING FUNCTIONS AND RECURRENCE RELATIONS ***(11 Periods)***

Generating Functions: Generating functions of sequences, Calculating coefficients of generating functions.
Recurrence Relations: Recurrence relations, Solving recurrence relations by substitution and generating functions, The method of characteristic roots, Solutions of homogeneous recurrence relations.

Module 5: GRAPHS AND TREES ***(09 Periods)***

Graphs: Basic concepts of Graph theory, Planar and Complete graph, Matrix representation of Graphs, Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest path algorithms.
Trees: Introduction to Trees, Properties of Trees, Spanning Trees, Depth-First Search, Breadth-First Search, Minimum Spanning Trees.

Total Periods: 45

EXPERIENTIAL LEARNING
The following is the sample. Faculty shall frame according to the course domain.

1. Let a > 1 be a positive integer. Pretend you want to divide n people into some number of teams, each of size a or a + 1. Show that this is possible provided n is larger than values in the Fibonacci polynomial a2 −a−1 = a(a−1)−1.
2. Identify the relations on the set of bits B = {0, 1} that are partial orders and those that are equivalence relations.
3. Pretend you are writing traffic accident software and want to categorize accidents by the day of the week on which they occur. Pretend there are n accident reports to categorize.
   (a) What is the size of the sample space? That is, in how many ways can the n accident reports be distributed over 7 days?
   (b) In how many ways can all n accidents occur on one single day?
   (c) In how many ways can all n accidents occur on only two days?
   (d) Let's looks at the other end: In how many ways can all n accidents occur on seven, and no less, days.

RESOURCES

TEXT BOOKS:

1. Kenneth H. Rosen, *Discrete Mathematics and its Applications,* Tata McGraw Hill, 8th Edition, 2019.
2. Jon Pierre Fortney, *Discrete Mathematics for Computer Science*, CRC Press, Taylor & Francis Group, 1st Edition, 2021.

REFERENCE BOOKS:

1. Richard Johsonbaugh, *Discrete Mathematics*, Prentice Hall,8th Edition, 2019.
2. Narasing Deo, *Graph Theory with application to Engineering and Computer Science*, Prentice Hall India 2016.
3. J.P. Trembly and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science,*Tata McGraw Hill, 37th Edition, 2017.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/106106183
2. https://nptel.ac.in/courses/106106094
3. https://nptel.ac.in/courses/111107058

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22CS101001	**DIGITAL LOGIC DESIGN**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite Switching Theory and Logic Design

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on Foundations in the operation of digital gates, Concepts of Boolean algebra, Minimization of logic circuits, Design and implementation of combinational and sequential logic circuits, Design digital systems using Programmable logic.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply knowledge of binary systems, logic gates and Boolean functions to represent a given problem using Boolean logic.
CO2. Minimize and implement Boolean functions to build combinational logic circuits.
CO3. Design combinational and sequential logic circuits for digital systems.
CO4. Design digital systems using programmable logic to solve engineering problems.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-	-	-	3	-
Course Correlation Mapping	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-	**3**	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BINARY SYSTEMS AND BOOLEAN ALGEBRA ***(10 Periods)***

Introduction, Binary Numbers, Number Base Conversions, Error Detection and Correction, Complements of Numbers, Signed Binary Numbers, Binary Codes, Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates.

Module 2: GATE LEVEL MINIMIZATION ***(09 Periods)***

The Map Method, Four Variable K-Map, Product-of-Sums and Sum-of-Products Simplification, Don't Care Conditions, NAND and NOR Implementations, Other Two Level Implementations, Exclusive–OR function.

Module 3: COMBINATIONAL LOGIC ***(09 Periods)***

Combinational Circuits, Analysis of Combinational Circuits, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, De-Multiplexers.

Module 4: SEQUENTIAL LOGIC ***(10 Periods)***

Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, Design of Synchronous Sequential Circuits, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter and Johnson Counter.

Module 5: PROGRAMMABLE LOGIC ***(07 Periods)***

RAM, ROM, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Design the digital circuit system of the vehicle with two photocell sensors, which work as inputs. Simulate the virtual circuit using NI Multisim software considering the following specifications:
   a) Each side (right of left) of that sensor circuit which communicate with each motor to output the signals so the vehicle can correct the direction along the track and drive. The track is outlined by two LED strip lights, as an input source, on both ends adhered on the ground about one feet apart. For instance, when the vehicle is close to the LED strip lights on the right-side track, the right side of the photocell sensor detects the bright lights, and it sends a positive signal to the left motor. That is, the input of the left photocell logic is 0 (off) because the left sensor does not detect the light and the right photocell logic is 1 (on). The output of the left and right motors in this case are represented as logics 1 and 0 respectively, which makes only the left motor spins to steer to the left side moving away from the right side of LED strip.
   b) Once the vehicle moves off the light, the both sides of the motors will operate and the vehicle would move straight forward until it encounters another LED strip light. In the case of the left side, the opposite would happen. The left sensor detects the LED strip light on the left side track. Thus, only the right motor will run to make the vehicle to steer to the right side.
   c) Since two LED strips are far (about 30 cm) apart, both the left and right photocell will not detect the light at the same time. However, it can be defined as negative output for both motors to follow the logics and therefore the vehicle will stop moving.

(It's an indicative one. The course instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th edition, Pearson, 2018.

REFERENCE BOOKS:

1. A. Anand Kumar, Switching Theory and Logic Design, 3rd edition, PHI Learning Private Limited, India, 2016.
2. Charles H. Roth, Jr. and Larry L. Kinney, Fundamentals of Logic Design, 7th edition, Cengage Learning, 2015.
3. Alan B. Marcovitz, Introduction to Logic Design, 3rd edition, McGraw Hill, 2010.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/108106177
2. https://nptel.ac.in/courses/106105185
3. https://www.youtube.com/watch?v=RZo--xYfTR4
4. https://www.youtube.com/watch?v=3vEV55D103g
5. https://www.youtube.com/watch?v=axGvxdUpEIE
6. https://www.youtube.com/watch?v=QEFW4DcyOC0
7. https://www.youtube.com/watch?v=wIeqYG4c6Ho

WEB RESOURCES:

1. https://www.rapidtables.com/convert/number/base-converter.html
2. https://learnabout-electronics.org/Digital/dig10.php
3. https://www.tutorialspoint.com/computer_logical_organization/digital_counters.htm

4. https://www.electronics-tutorial.net/programmable-logic-devices/complex-programmable-logic-device/
5. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/comp_networks_sm/labs/exp1/procedure.php
6. https://unacademy.com/course/logic-gates-and-boolean-algebra-iit-jee/GUT1BCXY
7. https://byjus.com/jee/basic-logic-gates/
8. https://web.stanford.edu/class/archive/ee/ee108a/ee108a.1082/reader/ch1to12.pdf

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22AI104002	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	3	-	2	4	5

Pre-Requisite Programming for Problem Solving

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is emphasize on the fundamentals structure design with classes including development, testing, implementation and documentation. This course also focuses on understanding and practical mastery of object oriented concepts such as classes, objects, data abstraction, methods, method overloading, inheritance and polymorphism. By end of the course, students will acquire the basic knowledge and skills necessary to implement object-oriented programming techniques in software development using Java.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply object oriented programming constructs to solve computational problems.

CO2. Use Exception handling and multithreading mechanisms to create efficient software applications.

CO3. Create Web based applications using collections frameworks to solve real world problems.

CO4. Design and develop GUI using applets and swings for internet and system based applications.

CO5. Work independently or in team to solve problems with effective communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
CO2	3	3	3	-	-	-	2	-	-	-	-	2	3	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	2	-	3	-	-	-
CO4	2	3	3	-	-	-	-	2	-	-	-	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-
Course Correlation Mapping	1	3	2	3	1	-	1	2	3	3	2	1	3	-	-	

Correlation Levels: 3: High; 2: Medium;1: Low

COURSE CONTENT

Module 1: OOPS FUNDAMENTALS ***(09Periods)***

Introduction: History of Java, Byte code, JVM, Java buzzwords, OOP principles, Data types, Variables, Scope and life time of variables, Operators, Control statements, Type conversion and casting, Arrays.

Concepts Of Classes And Objects: Introducing methods, Method overloading, Constructors, Constructor overloading, Usage of static with data and method, Access control, this key word, Garbage collection, String class, StringTokenizer.

Module 2: INHERITANCE, INTERFACE AND PACKAGES ***(09Periods)***

Inheritance basics, Types of inheritance, Member access rules, Usage of super key word, Method overriding, Usage of final, Abstract classes, Interfaces - differences between abstract classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces; Packages - defining, creating and accessing a package, importing packages, access control in packages.

Module 3 EXCEPTION HANDLING AND MULTITHREADING ***(10 Periods)***

Exception Handling: Concepts of exception handling, Types of exceptions, Usage of try, catch, throw, throws and finally keywords, Built-in exceptions, Creating user defined exception;
Multithreading: Concepts of multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter thread communication.

Module 4 COLLECTION FRAMEWORK ***(08 Periods)***

Collection Framework: Collections Overview, Collection Interfaces - List, Set, Map, List - ArrayList, Linked List, Vector, Set - HashSet, TreeSet, Map - HashTable, HashMap, Accessing a collection via an Iterator, comparator, comparable.

Module 5 GUI PROGRAMMING ***(09 Periods)***

GUI Programming With Applets: Applets - Applet Class, Applet skeleton, Simple Applet; Delegation event model - Events, Event sources, Event Listeners, Event classes, handling mouse and keyboard events.
Exploring Swing Controls: JLabel and Image Icon, JText Field, JButton, JCheckBox, JRadioButton, JTabbed Pane, JList, JCombo Box.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

OOPS Fundamentals

1. Develop a Java application for generating Electricity bill.

a) Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units - Rs. 1 per unit
- 101-200 units - Rs. 2.50 per unit
- 201 -500 units - Rs. 4 per unit
- >501 units - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- > 501 units - Rs. 7 per unit

b) Design a class to represent a Student details include the Student ID, Name of the Student, Branch, year, location and college. Assign initial values using Constructor. Calculate average of marks of 6 subjects and calculate attendance percentage.

2. a) Create a class Student which has data members as name, branch, roll no, age, sex, marks in five subjects. Display the name of the student and his percentage who has more than 70%.Use array of objects.

b) Write a program to perform addition of two complex numbers using constructor overloading. The first constructor which takes no argument is used to create objects which are not initialized, second which takes one argument is used to initialize real and imaginary parts to equal values and third which takes two argument is used to initialized real and imaginary to two different values.

Inheritance

3 a) Create a base class basic_info with data members name, roll no, sex and two member functions getdata and display. Derive a class physical_fit from basic_info which has data members height and weight and member functions getdata and display. Display all the information using object of derived class.

b) Create class first with data members book no, book name and member function getdata and putdata. Create a class second with data members author name, publisher and members getdata and showdata. Derive a class third from first and second with data member no of pages and year of publication. Display all these information using array of objects of third class.

4 A High School application has two classes: The Person superclass (Name, age, Gender) and the Student subclass (RegNo, Dept, CGPA).Using inheritance, create two new classes, Teacher and College Student. Teacher will be like Person but will have additional properties such as salary (the amount the teacher earns) and subject (e.g., "Computer Science", "Chemistry", "English", "Other"). The College Student class will extend the Student class by adding a year (current level in college) and major (e.g., "Electrical Engineering", "Communications", "Undeclared"). Create objects and test the functionality of all the methods.

5 Develop a java application for generating pay slip on different category of employees using the concept of inheritance.

Exception Handling and Multithreading

6 Consider two integers x and y as inputand compute the value of x/y.
Implement a class which raise an exception if x and y are not signed integers or if y is zero.

7 a) Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number

b) Write a program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.

Collection Framework

8 Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

GUI Programming

9 a) Write a java program that simulates a traffic light. The program lets the user select one of three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with "STOP" or "READY" or "GO" should appear above the buttons in selected color. Initially, there is no message shown.

b) Write an Applet that computes the payment of a loan on the amount of the loan, the interest rate and the number of months. It takes one parameter from the browser. Monthly; if true, the interest rate is per month, otherwise the interest rate is annual.

c) Write a java programs to find factorial of a number. User is allowed to enter a number into the text field whose factorial is to be determined. On pressing the button the value of the text field is firstly converted into integer and then processed to find its factorial. The result will get displayed in another text field. (Hint: use swings).

PROJECT BASED LEARNING:

Faculty shall provide Projects relevant to the contents of the course.

Sample Projects:

1. CALENDER APPLICATION

Develop a calendar application that uses many windows properties to make it colorful, for example, to indicate the vacation, it uses the red foreground color. The calendar can be used for two purposes. First to see the date and month as usual calendars and second to find out the day corresponding to given date. Some of the salient features of the project are

1. It uses various windows properties to make the program colorful although it has lack of graphics.
2. It entirely uses java code which is written in simple manner with lots of comments and important notes can be added.
3. The date with such notes appears different than others with red background color
4. The months can be navigated using arrow keys.

2. TICKET RESERVATION SYSTEM

Develop Ticket reservation system to manage details of seats, passenger, trains, Bookings and stations. The features required to be implemented are as follows

1. Provides searching facility based on factors such as seats, trains, booking and
2. stations
3. Manage the information of passengers
4. Shows the information of the seats and trains
5. Provide filter on train, booking, time and station
6. Information Management of booking
7. Export excel report for trains, passengers and station
8. Export pdf for booking details

RESOURCES

TEXT BOOKS:

1. Herbert Schildt, "Java the complete reference", 11th edition, McGraw Hill, Education,2018.
2. C. Thomas Wu, "An Introduction to Object-Oriented Programming with Java 5th edition", McGraw-Hill Higher Education 2010.

REFERENCE BOOKS:

1. J. Nino and F.A. Hosch," An Introduction to programming and OOPS design using Java", 3rd edition, John Wiley & sons, 2008.
2. P. Radha Krishna," Object Oriented Programming through Java", 1st edition, Universities Press, 2007.

SOFTWARE/TOOLS:

1. Software: Eclipse / Net beans / JDK 1.7
2. Java compatible web browser

VIDEO LECTURES:

1. https://nptel.ac.in/courses/106105191
2. https://www.udemy.com/course/java-tutorial/

WEB RESOURCES:

1. https://www.tutorialspoint.com/java/java_tutorial.pdf
2. https://www.guru99.com/java-tutorial.html