ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

CURRICULUM (REGULATIONS – R23)

A.Y. 2023-24

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING - CURRICULUM

REGULATIONS – R23 for the A.Y 2023-24

Semester – I (First year)										
Course Code	Title of the Course	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Contact Hours/ Week				
23MA1101	Linear Algebra and Multi Variable Calculus	BS	2	1	0	3	40	60	100	3
23PY1101	Engineering Physics	BS	2	1	0	3	40	60	100	3
23CS3101	Problem Solving and Programming using C	ES	2	1	0	3	40	60	100	3
23ME3204	Computer Aided Engineering Graphics	ES	1	0	4	5	40	60	100	3
23EE3103	Fundamentals of Electrical and Electronics Engineering	ES	2	1	0	3	40	60	100	3
23PY1201	Engineering Physics Lab	BS	0	0	3	3	50	50	100	1.5
23CS1201	Problem solving and Programming using C Laboratory	ES	0	0	3	3	50	50	100	1.5
23ME3202	Engineering and IT Workshop	ES	0	0	3	3	50	50	100	1.5
23MC0102	Environmental Science (Mandatory non-credit course)	MC	2	0	1	3	0	0	0	0
			Total Credits							19.5

Semester – II (First year)										
Course Code	Title of the Course	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Contact Hours/ Week				
23MA1102	Ordinary Differential Equations and Numerical Methods	BS	2	1	0	3	40	60	100	3
23EN2101	Communicative English	HS	2	1	0	3	40	60	100	3
23CY1101	Engineering Chemistry	BS	3	0	0	3	40	60	100	3
23EC3103	Digital Logic Design	ES	2	1	0	3	40	60	100	3
23ME3104	Engineering Mechanics & Strength of Materials	ES	2	1	0	3	40	60	100	3
23CS3202	Applied Python Programming	ES	1	0	2	3	100	0	100	2
23EN2201	Communicative English Language Laboratory	HS	0	0	2	2	50	50	100	1
23CY1201	Engineering Chemistry Laboratory	BS	0	0	3	3	50	50	100	1.5
23MC0101	Universal Human Values and Ethics (Mandatory non-credit course)	MC	2	0	0	2	0	0	0	0
			Total Credits							19.5

Semester – III (Second year)										
Course Code	Title of the Course	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Contact Hours/ Week				
23MA1103	Vector Calculus and Transform Techniques	BS	2	1	0	3	40	60	100	3
23EE4111	Electrical Measurements	PC	2	1	0	3	40	60	100	3
23EC3104	Electronic Circuit Analysis	PC	2	1	0	3	40	60	100	3
23EE4112	Network Theory	PC	2	1	0	3	40	60	100	3
23EE4113	Performance of DC Machines & Transformers	PC	2	1	0	3	40	60	100	3
23EE4211	Networks & Measurements Laboratory	PC	0	0	3	3	50	50	100	1.5
23EC4203	Electronic Circuit Laboratory	PC	0	0	3	3	50	50	100	1.5
23CS9216	Foundations of Data Visualization and Analytics	SC	0	0	3	3	100	0	100	1.5
23ME3203	Design Thinking	ES	1	0	2	3	100	0	100	2
23CR2101	Logical Reasoning and Verbal Ability Skills	HS	0	0	2	2	100	0	100	1
23MC0104	Entrepreneurship and IPR (Mandatory non-credit course)	MC	2	0	0	2	0	0	0	0
			Total Credits							22.5

Semester – IV (Second year)										
Course Code	Title of the Course	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Contact Hours/ Week				
23MA1104	Complex Variables and Probability	BS	2	1	0	3	40	60	100	3
23EC4102	Signals & Systems	PC	2	1	0	3	40	60	100	3
23EE4114	Electromagnetics	PC	2	1	0	3	40	60	100	3
23EE4115	Performance of Induction and Synchronous Machines	PC	2	1	0	3	40	60	100	3
23EE4116	Microprocessors and Micro Controllers	PC	2	1	0	3	40	60	100	3
23EE4212	Electrical Machines Laboratory-1	PC	0	0	3	3	50	50	100	1.5
23EE4213	Microprocessors and Micro Controllers Laboratory	PC	0	0	3	3	50	50	100	1.5
23EE9201	Data Structures	SC	0	0	3	3	100	0	100	1.5
23CR2102	Numerical Ability and Professional Communication Skills	HS	0	0	2	2	100	0	100	1
23MC0105	Financial Literacy (Mandatory non-credit course)	MC	2	0	0	2	0	0	0	0
			Total Credits							20.5

1. **Bridge Course: Python Programming** (for LE's)

Semester – V (Third year)										
Course Code	Title of the Course	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Contact Hours/ Week				
23DP6111		**OE-I**	2	1	0	3	40	60	100	3
23EE4117	Linear Control Systems	PC	2	1	0	3	40	60	100	3
23EE5111		**PE-1**	2	1	0	3	40	60	100	3
23EE4118	Power Transmission and Distribution	PC	2	1	0	3	40	60	100	3
23EC4106	Pulse, Digital and Integrated Circuits	PC	2	1	0	3	40	60	100	3
23EE4214	Electrical Machines Laboratory-II	PC	0	0	3	3	50	50	100	1.5
23EC4204	Pulse, Digital and Integrated Circuits Laboratory	PC	0	0	3	3	50	50	100	1.5
23EE9202	Circuit Simulation and PCB Design	SC	0	0	3	3	100	0	100	1.5
23CR2103	Quantitative Aptitude and Effective Communication	HS	0	0	2	2	50	50	100	1
23EE9401	Summer Internship	PROJ	0	0	0	0	100	0	100	1.5
			Total Credits							**22**

Name of the Track	Open Elective-I	Open Elective-II	Open Elective-III	Open Elective-IV
Software	Database Management System using MySQL	Introductions to JAVA	Cyber Security	NPTEL
Electronics & communication	Analogue and Digital Electronics	VLSI	Digital Signal Processing	NPTEL
Management	Lean Start-up Management	Industrial Marketing	Digital and Social Media Marketing	NPTEL
Humanities	Indian Constitution	Foreign Language	Gender Equality and Women Empowerment	NPTEL

Professional Elective –I
1. Electrical Power Generation and Utilization
2. Industrial Servo & Control Systems
3. Electrical Safety Management
4. Embedding Sensors and Motors
5. Dynamic Elective

2. **Value Added Course: Introduction to MATLAB/ETAP/ PSPICE etc.**

Semester – VI (Third year)										
Course Code	Title of the Course	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Contact Hours/ Week				
23DP6112		**OE-II**	2	1	0	3	40	60	100	3
23EE4119	Power System Protection	PC	2	1	0	3	40	60	100	3
23EE5112		**PE-II**	2	1	0	3	40	60	100	3
23EE4120	Power System Analysis	PC	2	1	0	3	40	60	100	3
23EE4121	Power Electronics	PC	2	1	0	3	40	60	100	3
23EE4215	Embedded Systems	PC	1	0	2	3	100	0	100	2
23EE4216	Control Systems Laboratory	PC	0	0	3	3	50	50	100	1.5
23EE9203	Internet of Things	SC	0	0	3	3	100	0	100	1.5
23CR2104	High level Reasoning and Employability Skills	HS	0	0	2	2	50	50	100	1
			Total Credits							**21**

Name of the Track	Open Elective-I	Open Elective-II	Open Elective-III	Open Elective-IV
Software	Database Management System using MySQL	Introductions to JAVA	Cyber Security	NPTEL
Electronics & communication	Analogue and Digital Electronics	VLSI	Digital Signal Processing	NPTEL
Management	Lean Start-up Management	Industrial Marketing	Digital and Social Media Marketing	NPTEL
Humanities	Indian Constitution	Foreign Language/Regional Language	Gender Equality and Women Empowerment	NPTEL

Professional Elective –II
1. Advanced Control Systems
2. AI Techniques in Electrical Engineering
3. Electrical Drives & Traction
4. Distribution Network Planning for UG Cable
5. Dynamic Elective

3. **Value Added Course: Electrical Machine Design Software/ PSCAD/POWERWORLD**

Semester – VII (Fourth year)										
Course Code	Title of the Course	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Contact Hours/ Week				
23DP6113		**OE-III**	2	1	0	3	40	60	100	3
23EE5113		**PE-III**	2	1	0	3	40	60	100	3
23EE5114		**PE-IV**	2	1	0	3	40	60	100	3
23EE5115		**PE-V**	2	1	0	3	40	60	100	3
23EN2102	Engineering Economics & Management	**HS**	3	0	0	3	40	60	100	3
23EE4217	Power Electronics Laboratory	PC	0	0	3	3	50	50	100	1.5
23EE4218	Power Systems Simulation Laboratory	PC	0	0	3	3	50	50	100	1.5
23EE9501	Project –I & Vocational Course/Skill Advanced Course	PROJ	0	0	4	4	60	0	60	2
23EE9402	Summer Internship	PROJ	0	0	0	0	100	0	100	1.5
			Total Credits							**21.5**

Name of the Track	Open Elective-I	Open Elective-II	Open Elective-III	Open Elective-IV
Software	Database Management System using MySQL	Internet of Things	Introductions to JAVA	NPTEL
Electronics & communication	Analogue and Digital Electronics	VLSI	Digital Signal Processing	NPTEL
Management	Lean Start-up Management	Industrial Marketing	Digital and Social Media Marketing	NPTEL
Humanities	Indian Constitution	Foreign Language	Gender Equality and Women Empowerment	NPTEL

Professional Elective –III
1. Digital Control Systems
2. Energy Management & Control
3. E H V A C
4. Testing & Commissioning of Electrical Equipment
5. Industrial Automation with PLC

Professional Elective –IV
1. Nonlinear Systems
2. Electric Hybrid Vehicles
3. Power Quality
4. Renewable Energy Technologies
5. Substation Automation SCADA & EMS

Professional Elective –V
1. Design, Erection and Commissioning of Solar Power Plants
2. Smart Grid Technologies
3. Modern Industrial Drives
4. HVDC & FACTS
5.Dynamic Elective

Vocational Course	Repair and Maintenance of Home Appliances / Electrical Installation	Solar PV Installation	E-Vehicle Assembly and Service Technology	Transformer Manufacturing, Repairing and Maintenance

4. **Value Added Course: Embedded C Programming/SAM**

Semester – VIII (Fourth year)										
Course Code	Title of the Course	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Contact Hours/ Week				
23DP6114		OE-IV	2	1	0	3	40	60	100	3
23EE9502	Project – II / Internship in Industry	PROJ	0	0	7	7	60	80	140	10.5
			Total Credits							13.5

Name of the Track	Open Elective-I	Open Elective-II	Open Elective-III	Open Elective-IV
Software	Database Management System using MySQL	Introductions to JAVA	Cyber Security	NPTEL
Electronics & communication	Analogue and Digital Electronics	VLSI	Digital Signal Processing	NPTEL
Management	Lean Start-up Management	Industrial Marketing	Digital and Social Media Marketing	NPTEL
Humanities	Indian Constitution	Foreign Language	Gender Equality and Women Empowerment	NPTEL

Category wise Credits Distribution

S. No.	Year	Ist Year		2nd Year		3rd Year		4th Year		Total	AICTE	APSCHE
	Sem	I	II	I	II	I	II	I	II			
	Category											
1	HS		4	1	1	1	1	3		11	12	10
2	BS	7.5	7.5	3	3					21	25	21
3	ES	12	8	2						22	24	24
4	PC			15	15	12	12.5	3		57.5	48	51
5	OE					3	3	3	3	12	18	12
6	PE					3	3	9		15	18	15
7	PR					1.5		3.5	10.5	15.5	15	17
8	MC									--	Non-credit	Non-credit
9	SC			1.5	1.5	1.5	1.5			6	---	10
	Total	**19.5**	**19.5**	**22.5**	**20.5**	**22**	**21**	**21.5**	**13.5**	**160**	**160**	**160**

Assigning of Credits

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

BS – Basic Science Courses	OE – Open Elective Courses
HSM – Humanities and Social Science and Management Courses	SC – Skill Course
ES– Engineering Science Courses	PROJ – Project, Seminar, Internship
PC – Professional Core Courses	MC – Mandatory Non-credit Courses
PE – Professional Elective Courses	

Open Electives offered by EEE Department for Other Branches (Except EEE Branch)

Name of the Track	Open Elective-I	Open Elective-II	Open Elective-III	Open Elective-IV
Energy Management	Introduction to Renewable Energy	Introduction to Electric & Hybrid Vehicles	Introduction to Cyber Security in Power Sector	NPTEL/Coursera

Engineering Courses offered by EEE Department for other Branches

Course Code	Subject	Branch
23EE3101	Basics Electrical and Electronics Engineering (BEEE)	CSE, CSE (AI &ML) CSE (DS), IT, Mechanical, Chemical
23EE3102	Electrical Circuit Theory	ECE
23EE3201	Basics of Electrical & Electronics Engineering Lab	Mechanical
23EE4117	Linear Control Systems	ECE

HONORS & MINORS

HONORS										
Power Systems Track - 1										
CODE	**SUBJECT NAME**	**Category**	**Periods**				**Sessional Marks**	**Semester end Exam marks**	**Total Marks**	**Credits**
			L	**T**	**P**	**Total**				
23EE8111	Electrical Safety Management	HR	3	0	2	5	40	60	100	4
23EE8112	Principles of Substation Design and Construction	HR	3	0	2	5	40	60	100	4
23EE8113	Testing and Commissioning of Electrical Equipment	HR	3	0	2	5	40	60	100	4
23EE8114	Electrical Design, Estimation and Energy Audit	HR	3	0	2	5	40	60	100	4
23EE8315	MOOCS	HR	0	0	0	0	0	100	100	4

Power Electronics Track -2										
CODE	**SUBJECT NAME**	**Category**	**Periods**				**Sessional Marks**	**Semester end Exam marks**	**Total Marks**	**Credits**
			L	**T**	**P**	**Total**				
23EE8121	Fundamentals of Power Electronics	HR	3	0	2	5	40	60	100	4
23EE8122	Switched-Mode DC-DC Converters	HR	3	0	2	5	40	60	100	4
23EE8123	Advanced Electrical Drives	HR	3	0	2	5	40	60	100	4
23EE8124	Advanced Semiconductor Devices	HR	3	0	2	5	40	60	100	4
23EE8325	MOOCS	HR	0	0	0	0	0	100	100	4

Control Systems Track - 3										
CODE	**SUBJECT NAME**	**Category**	**Periods**				**Sessional Marks**	**Semester end Exam marks**	**Total Marks**	**Credits**
			L	**T**	**P**	**Total**				
23EE8141	Industrial Instrumentation & Automation	HR	3	0	2	5	40	60	100	4
23EE8142	State Estimation & System Identification	HR	3	0	2	5	40	60	100	4
23EE8143	Optimal Control Systems	HR	3	0	2	5	40	60	100	4
23EE8144	Advance Control Theory	HR	3	0	2	5	40	60	100	4
23EE8344	MOOCS	HR	0	0	0	0	0	100	100	4

Energy Systems Track -4										
CODE	SUBJECT NAME	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Total				
23EE8151	Utilization and Conservation of Electrical Energy	HR	3	0	2	5	40	60	100	4
23EE8152	Energy Storage systems	HR	3	0	2	5	40	60	100	4
23EE8153	Waste to Energy Conversion	HR	3	0	2	5	40	60	100	4
23EE8154	Renewable Energy and Grid Interface Technologies	HR	3	0	2	5	40	60	100	4
23EE8354	MOOCS	HR	0	0	0	0	0	100	100	4

Smart Grid Track-5										
CODE	SUBJECT NAME	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Total				
23EE8171	Introduction to the Internet of Things and Embedded Systems	HR	3	0	2	5	40	60	100	4
23EE8172	Distributed Generation and Micro grid	HR	3	0	2	5	40	60	100	4
23EE8173	Advanced Battery and Fuel Cell Technologies	HR	3	0	2	5	40	60	100	4
23EE8174	Cyber Security in Power Sector	HR	3	0	2	5	40	60	100	4
23EE8374	MOOCS	HR	0	0	0	0	0	100	100	4

MINORS										
Smart Grid Track - 1										
CODE	SUBJECT NAME	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Total				
23EE7101	Introduction to Smart Grid Technologies	MR	3	0	2	5	40	60	100	4
23EE7102	Introduction to Electric Vehicles	MR	3	0	2	5	40	60	100	4
23EE7103	Introduction to Renewable Energy and Grid Interface Technologies	MR	3	0	2	5	40	60	100	4
23EE7104	Cyber Security in Smart Grid	MR	3	0	2	5	40	60	100	4
23EE7105	MOOC	MR	3	0	2	5	0	0	100	4
Electrical Safety & Erection Track -2										
CODE	SUBJECT NAME	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Total				
23EE7106	Electrical Safety Management	MR	3	0	2	5	40	60	100	4
23EE7107	Testing and Commissioning of Electrical Equipment	MR	3	0	2	5	40	60	100	4
23EE7108	Principles of Substation Design and Construction	MR	3	0	2	5	40	60	100	4
23EE7109	Design, Erection and Commissioning of Solar Power Plants	MR	3	0	2	5	40	60	100	4
23EE7110	MOOC	MR	3	0	2	5	0	0	100	4
Indian Power Sector Track-3										
CODE	SUBJECT NAME	Category	Periods				Sessional Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	Total				
23EE7111	Introduction to Deregulated Power Systems	MR	3	0	2	5	40	60	100	4
23EE7112	Open Access, Power Trading and Tariffs – ABT Scenario	MR	3	0	2	5	40	60	100	4
23EE7113	Energy Conservation & Audit	MR	3	0	2	5	40	60	100	4
23EE7114	Energy Efficient Buildings	MR	3	0	2	5	40	60	100	4
23EE7115	MOOC	MR	3	0	2	5	0	0	100	4

Electrical Industrial Applications Track-4										
CODE	**SUBJECT NAME**	**Category**	**Periods**				**Sessional Marks**	**Semester end Exam marks**	**Total Marks**	**Credits**
			L	**T**	**P**	**Total**				
23EE7116	Basics of Embedded Systems	MR	3	0	2	5	40	60	100	4
23EE7117	Industrial PLC with Automation	MR	3	0	2	5	40	60	100	4
23EE7118	Industrial Servo and Control Systems	MR	3	0	2	5	40	60	100	4
23EE7119	Applications of AUTOCAD/ETAP/PSPICE/PSCAD/MULTISIM/LABVIEW/MATLAB software's	MR	3	0	2	5	40	60	100	4
23EE7120	MOOC	MR	3	0	2	5	0	0	100	4

S.NO	NAAC/NBA/NEP 2020	RELATED SUBJECTS						
1	**Stake holders feedback**	Python	Data Structures	DBMS	JAVA			
2	**Developmental needs**	Embedded Systems	IoT	Renewable Energy Technologies	Electric Hybrid Vehicles	Smart grid Technologies		
3	**Employability courses**	Python	Data Structures	DBMS	JAVA	Electric Hybrid Vehicles	Design, Erection and Commissioning of Solar Power Plants	Industrial Automation with PLC
4	**IPR & Entrepreneurship**	IPR	Entrepreneur Development Skills	Learning Start-up Management	Digital and Social Media Marketing			
5	**Skill Development**	Python	Data Structures	Embedded Systems	Foundations of Data Visualization and Analytics	Vocational courses		
6	**Cross cutting issues**	Universal Human values and Ethics	Gender Equality and Women Empowerment	Environmental Science				
7	**Value-added**	MATLAB/ETAP/ PSCAD/PSICE	MotorAnalysis (Electrical machine Design Software)	Embedded ‘C’ Programming	SAM			
8	**Towards NEP-2020**	Foreign Languages/ Hindi	Indian Constitution	Design Thinking	Financial literacy	YOGA	Vocational courses	
9	**Industry Requirements**	Design, Erection and Commissioning of Solar Power Plants	Testing and Commissioning of Electrical Equipment’s	Power Plant Engineering	Industrial Automation with PLC	Embedding Sensors and Motors	Distribution Network Planning for Underground Cable	Modern Industrial Drives
10	**Industry-Supported Lab**	Circuit Simulation and PCB Design	Embedded Systems	IoT				
11	**Multi-disciplinary courses**	Python Programming	Signals & Systems	Data Structures	Pulse, Digital & Integrated Circuits	DBMS	JAVA	
12	**Self-Learning**	OE-IV/NPTEL	Coursera	Infosys Springboard				
13	**Dynamic Electives**	PE III onwards						
14	**Industry delivery**	Industrial Automation with PLC	Modern Industrial Drives	Substation Automation SCADA & EMS				

Annexure

Course Codes Description				
Regulation	**Course Category**	**Kind of Course**	**Type of Course**	**Course Number**
23	PY-Physics	MC - 0	Theory - 1	Regular - 01
	CY- Chemistry	BS - 1	Practical / Lab - 2	Professional Core - 11/12/…
	MM - Mathematics	HS /HE - 2	MOOCs - 3	Professional Elective - 11/21/31/41/51
	EN - English	ES -3	Summer Internship - 4	Open Elective - 11/21/31/41….
	CS- Computer Science and Engineering	**PC - 4**	Project Work - 5	
	CM - CSE with AIML	PE-5	Seminars - 6	
	CD CSE with Data Science	OE / JE - 6	NCC / NSS - 7	
	ES - Engineering Science	MINORS - 7		
	EE - Electrical and Electronics Engineering	HONORS - 8		
	EC- Electronics and Communication Engineering	SKILL COURSES - 9		
	CH - Chemical Engineering			
	ME - Mechanical Engineering			
	CE - Civil Engineering			
	IT - Information Technology			
	MC - Mandatory Course			
	CR - Campus Recruitment			
	HS - Human Science			

LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS

Course Code: 23MA1101 **Credits:**3
Instruction : 3 periods & 1 Tutorial/Week Sessional Marks:40
End Exam : 3 Hours End Exam Marks:60

Prerequisites: Matrices, Differentiation, Integration and Functions.

Course Objectives:

- To provide the students with sufficient knowledge in calculus and matrix algebra, this can be used in their respective fields.

Course Outcomes: By the end of the course, students will be able to

1.	Apply elementary transformations to reduce the matrix into the echelon form and normal form to determine its rank and interpret the various solutions of system of linear equations.
2.	Identify the special properties of a matrix such as the eigen value, eigen vector; employ orthogonal transformations to express the matrix into diagonal form, quadratic form and canonical form.
3.	Equip themselves familiar with the functions of several variables.
4.	Evaluate double and triple integrals techniques over a region in two dimensional and three dimensional geometry.
5.	Express the given function in terms of sine and cosine.

CO-PO –PSO Mapping:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1							1	2			
CO2	3	2	1	1							1	2			
CO3	3	2	1	1							1	2			
CO4	3	2	1	1							1	2			
CO5	3	2	1	1							1	2			

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

	CO-PO-PSO Justification
1	CO1 is a basic tool which is used to find a solution of a complex problem after reducing it into a system of linear equations in many areas of the engineering sciences.
2	CO2 deals with eigen values, eigen vectors of a square matrix which are widely used in all the engineering branches like communications systems, Designing bridges, Machine learning.
3	CO3 deals with partial derivatives which are widely used in all the branches of engineering sciences.
4	CO4 delas with the techniques of multiple integrals which are used to find the area, volume and other physical and geometrical parameters in all the areas of engineering sciences.
5	CO5 is used to represent the given periodic function as an infinite sum of cosine and sine terms.

SYLLABUS

UNIT I **[10 Periods]**

Linear Equations: Rank of matrix - Normal form of a matrix - PAQ form - Gauss Jordan method of finding the inverse - Consistency of linear system of equations.

Sections: 2.7 and 2.10.

UNIT II **[10 Periods]**

Linear transformations and Quadratic forms: Eigen values - Eigen vectors - Properties of eigen values (without proofs) - Cayley Hamilton theorem (without proof) - Reduction of quadratic form to canonical form - Nature of the Quadratic form.

Sections: 2.13, 2.14, 2.15, 2.17 and 2.18.

UNIT III **[10 Periods]**

Multivariable Calculus: Total derivatives - Chain rule - Change of variables - Jacobians - Taylor's series expansion of two variable function - Maxima and minima of functions of two variables - Method of Lagrange's multipliers.

Sections: 5.5, 5.6, 5.7, 5.9, 5.11 and 5.12.

UNIT IV **[10 Periods]**

Multiple Integrals : Double integrals - Change of order of integration - Double integration in polar coordinates - Areas enclosed by plane curves - Triple integrals - Volumes of solids (by using double and triple integrals).

Sections: 7.1, 7.2, 7.3, 7.4, 7.5 and 7.6.

UNIT V **[10 Periods]**

Fourier Series : Introduction - Euler's formulae (without proof) - Conditions for a Fourier expansion - Functions having points of discontinuity - Change of interval - Even and odd functions - Half range series.

Sections: 10.1, 10.2, 10.3, 10.4, 10.5, 10.6 and 10.7.

TEXT BOOKS:

1. **B. S. Grewal**, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

REFERENCE BOOKS:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. **N. P. Bali**, Engineering Mathematics, Lakshmi Publications.
3. **George B. Thomas, Maurice D. Weir and Joel Hass**, Thomas, Calculus, 13/e, Pearson Publishers, 2013.
4. **H. K. Dass**, Advanced Engineering Mathematics, S. Chand and company Pvt. Ltd.
5. **Michael Greenberg** Advanced Engineering Mathematics, Pearson, Second Edition.

ENGINEERING PHYSICS

(Common for ECE, EEE, Mechanical, Civil and Chemical)

Course Code: 23PY1101 **Credits:** 3
Instruction**:** L - 3, T- 1 P – 0 Sessional Marks: 40
End Exam : 3 Hours End Exam Marks: 60

Prerequisites: Basic concepts of Physics in 12^{th} level

Course Objectives

1. To impart knowledge in basic concepts of physics relevant to engineering applications
2. To introduce advances in technology for engineering applications

Course Outcomes: At the end of the course the student will be able to:

CO	COURSE OUTCOMES
CO-1	**Interpret** the relation between heat, work, and entropy with thermo dynamic laws.
CO-2	**Explain and analyze** the relation between electric field, electric current and magnetic fields, production and applications of ultrasonics
CO-3	**Apply** the optical phenomena like Interference, Diffractionand Polarization to various fields.
CO-4	**Explain** the working principle and applications of lasers andfiber optics.
CO-5	**Interpret** the microscopic behavior of matter with quantummechanics.

CO-PO Mapping:

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

Correlation levels1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes

CO-PO Justification	
1	CO1 deals with the fundamental concepts of thermodynamic laws and entropy, which are associated in all working instruments and machines in the development of components, **related to** engineering problems. All the Thermodynamics concepts are related to electrical and mechanical devices in terms of understanding heat and heat dissipation mechanisms in daily life. So mapped to PO1, PO2, PO3 and PO12
2	CO2 deals with the fundamental laws of electromagnetism give us **deep insight** of **working nature** for different electronic devices and instruments. The knowledge of electromagnetism allows them to design systems with minimal electromagnetic interference, leading to more reliable and robust engineering solutions. The knowledge of basic properties and applications of ultrasonic waves will allow their utility in all fields of industry. So mapped to PO1, PO2, PO3, PO4 and PO6.
3	CO3 gives the knowledge of polarization allows them to design antennas with specific polarization characteristics, matching requirements of wireless communication applications. The study of Interference and diffraction phenomenon will help to analyse the colours in thin films, non-reflective surfaces, refractive index of materials and importance of polaroid's. So mapped to PO1, PO2 and PO4.
4	CO4 deals with the lasers and optical fibre properties and their basic principle of working mechanisms. From this knowledge students can gain insight into emerging technologies in various fields. So mapped to PO1, PO4, PO5, PO6, PO10, PO11 and PO12.
5	CO5 deals with the basic knowledge of Quantum mechanics will help to understand Microscopic **behaviour** of matter which decides the macroscopic property of the system. The conceptual knowledge of Quantum mechanics is useful to **identify** and analyse the complex engineering aspects. So mapped to PO1 and PO2.

SYLLABUS

UNIT – I **[10 Periods]**

Thermodynamics:

Heat and work, first law of thermodynamics and its applications, reversible and irreversible processes, heat engine, Carnot cycle and its efficiency, Carnot's theorem, second law of thermodynamics, entropy – entropy change in reversible and irreversible processes, entropy and second law, entropy and disorder, entropy and probability, third law of thermodynamics.

Learning Outcomes:

The students will be able to

- Explain the relation between heat and work.
- Recognize how much heat is converted into work.
- Identify the relation between entropy and different thermodynamic phenomena.

UNIT-II **[10 Periods]**

ELECROMAGNETISM

Electric charge, electric flux, experimental law of Coulomb, electric field intensity (E), electric flux density (D), electric Potential (V).

Magnetic flux, magnetic field intensity (H), magnetic flux density (B), Biot-Savart's law, current density (J), first form of Ohm's law

Electromagnetic induction - Faraday's law of induction,

Properties of Dielectrics and its classifications (Polar, Non-Polar), Electric dipole, polarization,

Properties of magnetic materials and classification (Dia, Para, Ferro), magnetic dipole, magnetization

Ultrasonics: Properties of ultrasonic waves, production of ultrasonic waves by Magnetostriction and Piezoelectric methods, Applications of ultrasonics.

Learning Outcomes:

The students will be able to

- Explain how to generate electric current by electromagnetic induction Phenomena.
- Recognize the properties and production of ultrasonics.
- Identify the use of ultrasonics in different fields.

UNIT–III

OPTICS & OPTICAL DEVICES **[10 Periods]**

Interference: Parallel and wedge-shape thin films, Newton rings-Measurement of wavelength and refractive index, Applications as Non-reflecting coatings,.

Diffraction: Fraunhoffer Diffraction at a single slit, Applications - Dispersive and Resolving Powers.

Polarization: Double refraction, Nicola's prism, Production, detection, Applications – Anti-glare automobile headlights, Adjustable tint windows.

Learning Outcomes:

The students will be able to

- Explain various types of coherent sources.
- Outline the conditions for sustained interference.
- Analyze the differences between interference and diffraction.
- Illustrate the concept of polarization of light and its applications.
- Classify the production and detection of different polarized light.

UNIT–IV **[10 Periods]**

Lasers: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, He-Ne laser, Nd – YAG, CO_2 and semiconductor laser, applications of lasers

Optical Fibres: Principle and working of optical fibre, structure, types, advantages of optical fibre, acceptance angle and acceptance cone, numerical aperture, applications of optical fibres

Learning Outcomes:

The students will be able to

- Explain the working principle and properties of lasers
- Analyze the production and applications of lasers.
- Explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation.
- Identify the applications of optical fibers in medical, communication and other fields.

UNIT–V **[10 Periods]**

Quantum mechanics:

Planck's hypothesis, wave-particle duality, introduction to quantum theory, de-Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrodinger's time independent and time dependent wave equations, physical significance and properties of the wave function ψ, Application of Schrodinger wave equation for a particle in one dimensional well – Eigen wave functions and energy Eigen values of the particle and Quantum mechanical tunnelling- Potential Barrier

Elements of Statistical mechanics: Elementary concepts of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (no derivation)

Learning Outcomes:

The students will be able to

- Explain the dual nature of radiation and matter.
- Realize de Broglie concept of matter waves and Heisenberg uncertain principle.
- Identify Schrodinger wave equation to solve the problems.
- Explain the importance of fundamentals of statistical mechanics.

Text Books:

1. M. N. Avadhanulu & P.G.Kshirasagar, "A Text Book of Engineering Physics" – IX Edition, S. Chand Publications, 2014.
2. S. L. Gupta & Sanjeev Gupta, "Modern Engineering Physics"- Dhanpat Rai Publications, 2011.

Reference Books:

1. V. Rajendran, "Engineering Physics", McGraw-Hill Education Private Ltd, 2011
2. S.O. Pilai, Sivakami, "Engineering Physics" – IV Edition, New Age International Publishers, 2011
3. Young & Freedman, "University Physics" – XI Edition, Pearson Education, 2004
4. A. Marikina, "Engineering Physics" - PHI Learning Private Limited, 2009.
5. Resnick & Halliday, "Physics" Volume II – VI Edition, Wiley India Publications 2001.
6. R K Gaur, S L Gupta, "Engineering Physics" – VIII Edition, Dhanpat Rai
7. Publications, 2001.
8. D. K. Bhattacharya, Poonam Tandon, "Engineering Physics" – Oxford University Press, 2010.

PROBLEM SOLVING AND PROGRAMMING USING C

(Common to CSE, IT, Civil, EEE, ECE, Mechanical and Chemical)

Course Code: 23CS3101 **Credits : 3**
Instruction **:** L - 3, T- 1 P – 0 Sessional Marks : 40
End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

1. To learn how to solve a given problem.
2. To illustrate the basic concepts of C programming language.
3. To discuss the concepts of Functions, Arrays, Pointers and Structures.
4. To familiar with Dynamic memory allocation concepts.
5. To apply concepts of structures and files to solve real word problems.

Course Outcomes

After course completion, the students will be able to:

1	Demonstrate the ability to analyze complex problems and apply appropriate problem-solving techniques to devise effective solutions.
2	Apply control structures to solve programming problems effectively
3	Design efficient algorithms involving arrays, demonstrating a clear understanding of array data structures.
4	Solve programming problems that require the use of pointers, including pointer arithmetic and manipulation.
5	Demonstrate the ability to declare structure variables and define their member data types.

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	1	1				2				2		
CO2	3	3	3	3	2			1	2	2			2		
CO3	3	3	3	3	2	1		1	2		1	1	2	1	
CO4	3	3	3	3	2	1		1	2	1	2	1	2	1	
CO5	3	3	3	3	2	1		1	2	1	2	1	2	1	

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO-PO-PSO Justification	
1	CO1 deals with analyzing complex problems and applying problem-solving techniques, which requires a solid foundation of application of engineering knowledge, problem analysis, design/development of solutions, investigations of complex problems, modern tool usage, and considering the societal implications of engineering practice.
2	CO2 equips students with essential problem-solving and programming skills, which are crucial in addressing complex engineering problems and using modern tools effectively to develop solutions for the betterment of society.
3	CO3 can be attainable by enabling students to gain engineering knowledge, apply problem analysis, develop solutions, investigate complex problems, utilize modern tools, consider the engineer's role in society, and enhance their programming and software development skills in a progressive approach.
4	CO4 can be attained by enabling students to develop comprehensive expertise in utilizing pointers for efficient problem-solving while integrating a broad range of essential engineering and programming competencies with a societal context.
5	CO5 can be attained by aligning with the broader objectives of engineering knowledge application, problem analysis, design/development of solutions, and investigation of complex problems, modern tool usage, and consideration of societal and ethical responsibilities in professional engineering practice in progressive manner.

SYLLABUS

UNIT-1: **[10 Periods]**

Introduction to Problem Solving: Problem Solving Aspect, Problem Identification, Problem Understanding, Algorithm Development, Solution Planning, Flowcharts, flowgorithm.

Overview of C: History of C, C Language Elements, Basic Structure of C Program, C Tokens-Variables and Data Types, Operators, Expressions and Type Conversions.

UNIT-2: **[10 Periods]**

Control Statements: Selection Statements- if and switch statements.

Iterative Statements: for, while and do-while statements.

Jump Statements: break, continue and goto statements.

UNIT-3: **[10 Periods]**

Arrays: Declaration, accessing array elements, Storing values, Operations on arrays, Multi-dimensional arrays.

Functions: Introduction, Using Functions, Function declaration, Function definition and Function call, Scope of variable, Types of functions, Parameter passing, Passing arrays to functions, Recursion, Storage classes.

UNIT-4: **[10 Periods]**

Pointers: Declaration and Initialization of pointer variables, Pointer arithmetic, Pointers and arrays, Pointer to pointer, Array of pointers, Pointers and functions, Dynamic Memory Allocation.

Strings: Introduction to Strings, String I/O functions, String handling functions, Pre-processor Directives.

UNIT-5: **[10 Periods]**

Structures: Introduction, Nested Structures, Array of Structures, Structures and Functions, Unions.**Command-Line Arguments:** Command-line Arguments

Text Books:

1. Reema Thareja, Programming in C, Oxford University Press, AICTE Edition, 2018.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.

Reference Books:

1. Jeri R. Hanly, Ellot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson
2. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, 3/e, Cengage Learning, 2007.
3. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Second Edition, Prentice Hall Publication.
4. Paul Deitel, Harvey Deitel -C How to Program with an introduction to C++, Eighth Edition

COMPUTER AIDED ENGINERING GRAPHICS
(CHEM, CIVIL,CSD,CSM, EEE, ECE,IT)

Course Code:23ME3204 **Credits:**3
Instruction : 1 periods & 3 Practical/Week Sessional Marks:50
End Exam : 3 Hours End Exam Marks:50
Prerequisites: Nil

Course Objectives:

- The course is designed to introduce computer aided drafting skills and fundamentals of engineering drawing and further apply these principles to draw orthographic projections of points, planes, solids and isometric projections.

Course Outcomes:

By the end of the course, students will be able to

1.	**Draft** simple 2D drawings with dimensions using CAD software.
2.	**Project** orthographically points and lines in various positions using CAD software.
3.	**Produce** orthographic projections of plane surfaces using CAD software.
4.	**Draw** orthographic projections of solids in various orientations using CAD software.
5.	**Construct** isometric views and isometric projections of simple Machine parts using CAD software.

CO-PO –PSO Mapping

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2			3			1		2		1		
CO2	2	2			3			1		2		1		
CO3	2	2			3			1		2		1		
CO4	2	2			3			1		2		1		
CO5	2	2			3			1		2		1		

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

CO-PO-PSO Justification	
1	CO-1 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-1 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-1 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-1 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-1 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-1 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study

2	CO-2 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-2 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-2 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-2 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-2 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-2 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study
3	CO-3 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-3 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-3 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-3 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-3 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-3 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study
4	CO-4 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-4 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-4 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-4 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-4 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-4 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study
5	CO-5 satisfies two competencies (1.3&1.4) it is mapped to PO-1 at medium level. As CO-5 satisfies two competencies (2.2 & 2.4), it is mapped at medium level to PO-2. As CO-5 satisfies three competencies (5.1, 5.2 & 5.3), it is mapped at high level to PO-5. As CO-5 satisfies one competency (8.2), it is mapped at low level to PO-8. As CO-5 satisfies two competencies (10.1 & 10.3), it is mapped at medium level to PO-10. As CO-5 satisfies one competency (12.2), it is mapped at low level to PO-12 (Case Study

SYLLABUS

UNIT I : COMPUTER AIDED DRAFTING

Introduction, Applications, CAD software- AutoCAD, GUI, function keys, Drawing entities, Drafting aids(limits, layers, dimensioning, object snap, zoom), modify commands, Block, WBlock and insert, List of commands, Setting Isometric mode, Iso-planes, isometric commands.

Weekly Exercises:

Week 1: **a)** Limits, command line, command list, function keys- Ortho, polar, Osnap, Otrack etc.

b) Draw lines using dynamic input, Ortho & Polar, Line divide, construction line.

c) Drawings using coordinate system, arbitrary coordinate system.

d) Selection & Modify commands – offset, move, copy, rotate, trim, Scale.

Week 2: **a)** Layers, Match property, line types

b) Arcs and Circles

c) Fillet and Chamfer

d) Annotations and Dimensioning

Week 3: **a)** Symmetrical drawings using mirror
b) Rectangular Array
c) Polar and Path Array
d) Annotations and Dimensioning

Week 4: **a)** polygons
b) hatching
c) block, wblock, group, ungroup, explode
d) iso planes

UNIT II: ORTHOGRAPHIC PROJECTIONS – POINTS & LINES

Orthographic projections – projections of points – projections of straight lines (lines parallel to both HP&VP, lines parallel to one and inclined to other, lines inclined to both the planes)

Weekly Exercises:

Week 5: a) Projection of points

b) Shortest distance of points from principle plane

Week 6: a) A line parallel to both the planes

b) A line inclined one plane

c) A line inclined to both the planes

UNIT III: ORTHOGRAPHIC PROJECTIONS – PLANES

Projections of regular polygon planes – inclined to one plane, inclined to both the planes.

Weekly Exercises:

Week 7: Projection of plane inclined to one plane.

Week 8: Projection of planes inclined to both planes

UNIT IV: ORTHOGRAPHIC PROJECTIONS – SOLIDS

Projection of solids: Prisms – Cylinder– Pyramids &Cones –simple positions & axis inclined to one plane.

Weekly Exercises:

Week 9: Projection of solids in simple positions.

Week 10: Projection of solids inclined to one plane.

UNIT V: ISOMETRIC PROJECTIONS

Isometric projections –Isometric scale, Isometric view & projection of prisms, pyramids, cone, cylinder, sphere, and their combination, conversion of orthographic projection into isometric projection and vice-versa of simple machine parts.

Weekly Exercises:

Week 11: Iso-Ortho conversions of simple machine parts.

Week 12: Ortho-Iso conversions of simple machine parts.

TEXT BOOKS:

1. **Pradeep Jain** "*Engineering Graphics & Design*" ISBN 9789391505066, Khanna Book Publishing
2. **N. D. Bhatt** "*Engineering Drawing"* Charotar Publishing House Pvt. Ltd, 53rd Edition : 2014

REFERENCE BOOKS:

1. **K. L. Narayana & P. Kanniah** "*Engineering Drawing"*
2. **R. B. Choudary** "*Engineering Graphics* with Auto CAD"
3. **Trymbaka Murty** "*Computer Aided Engineering Drawing"*
4. **B.V.R. Gupta and M. Raja Roy** *"Engineering Drawing with Auto CAD"* ISBN-13 978-9384588960 I K International Publishing House 3rd Edition : 2016

FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

Course Code: 23EE3103 **Credits**:3

Instruction : 3 periods & 1 Tutorial/Week SessionalMarks:40

End Exam : 3 Hours End Exam Marks:60

Prerequisites: Basic Knowledge of electric current concepts and semiconductor devices from Intermediate

Course Objectives:

1. To analyze using basic network theorems and reduction techniques for d.c and a.c circuits.
2. To understand operation and phasor diagrams of various basic electronic components.
3. To understand the principle of operation of PN Junction Diode and Transistor and their characteristics.

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL-3	**Apply** the basic laws and **Determine** the parameters of electrical circuits
CO2	BL-3	**Apply** network theorems and **calculate** various parameters of DC circuits.
CO3	BL-4	**Explain** phasor diagrams for R, R-L, R-C and R-L-C circuits and **Apply** network theorems and **calculate** various parameters of A.C circuits.
CO4	BL - 4	**Interpre**t the behaviour of PN diode under different biasing conditions and **Analyze** the rectifier circuits
CO5	BL - 4	Analyze the characteristics of BJT and FET in different configurations and

CO- PO, PSO Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	1	
CO2	3	2	1	-	-	-	-	-	-	-	-	1	1	
CO3	2	1	-	1	-	-	-	-	-	-	-	1	1	
CO4	2	2	-	-	-	-	-	-	-	-	-	1	1	2
CO5	1	1	-	-	-	-	-	-	-	-	-	1	1	2

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

COS	DESCRIPTION
1	CO1 deals with Simplification of electrical network with the knowledge of fundamentals of basic electrical engineering and mathematics and analyse the networks by applying basic laws and to recognize the need of fundamental laws in power system. So it is mapped with PO1, PO2, PO12 and PSO1
2	CO2 deals with solving problems for different theorems with the knowledge of fundamentals of basic electrical engineering and mathematics for d.c Circuits and their use in design in power systems. So it is mapped with PO1, PO2, PO3, PO12 and PSO1
3	CO3 deals with the measurement of various powers with the knowledge of fundamentals of basic electrical engineering and mathematics for a.c. Circuits and also to analyze phasor diagram of Power system. It also deals with solving a.c network problems for different theorems with the knowledge of fundamentals of basic electrical engineering and mathematics and to design a part of power system components. So it is mapped with PO1, PO2, PO3, PO12 and PSO1
4	CO4 deals with the basic diode operations under various conditions and apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of embedded and VLSI and communicate them effectively to the concern and to design a part of power system circuit(rectifier) and power switching circuits. So it is mapped with PO1, PO2, PO12 and PSO1, PSO2
5	CO4 deals with the basic transistor operations under various conditions and apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of embedded and VLSI and communicate them effectively to the concern and to design a part of power system circuit (rectifier) and power switching circuits. So it is mapped with PO1, PO2, PO12 and PSO1, PSO2

UNIT I 12 Periods

Circuit Elements: Types of elements, Series and parallel Combinations of Resistance, Inductance and Capacitance, Network Reduction by Delta-Star transformation, Source transformation.

UNIT II 12 Periods

Elementary Network Theory: Mesh Analysis and Nodal Analysis, Superposition Theorem, Thevenin's and Norton's Theorems, Maximum Power Transfer Theorem, for DC Circuits.

UNIT III **12 Periods**

AC Circuits – Definitions of Average and Effective Values of Periodic Functions, Instantaneous, Complex, Real and Reactive Powers, Power Factor, Phasor diagrams of 1-ph R, L, C, RL, RC, RLC Circuits, Mesh Analysis and Nodal Analysis, Thevenin's, Norton's and Maximum Power Transfer Theorems for AC Circuits.

UNIT IV **12 Periods**

PN Junction Diode – Forward and Reverse Bias, V I Characteristics, operation of Half wave rectifier, Bridge rectifier, Centre-tapped Full Wave Rectifier, Zener diode operation.

UNIT V **12 Periods**

Transistor operation, Characteristics of Common Base, Common Emitter, Common Collector Configurations, Transistor as a switch, FET, Classification, Construction, operation and characteristics of JFET, Parameters of FET.

TEXTBOOKS:

1. William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, "Engineering circuit analysis", 9th edition, McGraw-Hill publications, 2021.

REFERENCE BOOKS:

1. Charles K. Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", 7th edition, McGraw-Hill publications, 2022.
2. V.K. Mehta & Rohit Mehta, "Principles of Electrical Engineering", 2nd edition, S.Chand Publications.

ENGINEERING PHYSICS LAB

(Common for ECE, EEE, Mechanical, Civil and Chemical)

Course Code: 23PY1201 **Credits:** 1.5

Instruction**:** L - 0, T- 0 P – 3 Sessional Marks: 50

End Exam : 3 Hours End Exam Marks :50

Course Objectives:

To enable the students to acquire skill, technique and utilization of **the** Instruments

Course Outcomes:

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

	COURSE OUTCOMES
CO-1	**Apply** the theoretical knowledge as working principles of Laboratory experiments related to Optics, Mechanics, Electromagnetic and Electronics. (**L3**)
CO-2	**Adop**t the experimental procedure to perform the experiments for Data procurement / Acquisition. (**L3**)
CO-3	**Compute** the required parameters by suitable formula using experimental values (observed values) in Mechanics, Optics, Electromagnetic and Electronics. (**L3**)
CO-4	**Analyze** the experimental data and obtain the results through graphical interpretation. (**L4**)
CO-5	**Perform** effectively as an individual or as a team and be Accountable / Responsible to the work rendered. (**L4**)

CO-PO Mapping:

	Program Outcomes (POs)												**PSOs**	
	Domain Specific POs					**Domain Independent POs**								
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				1	2						3		
CO2		2	1											
CO3				2				1						
CO4	1			3								1		
CO5								2	3	1	2			

List of experiment (any eight to ten experiments have to be completed)

1. Estimation of thickness of a thin paper by forming parallel interference fringes-Wedge method.
2. Newton's rings- determination of radius of curvature of a convex lens
3. Find out the wavelengths of spectral lines in mercury spectrum-using diffraction grating in normal incidence position.
4. Evaluation of refractive indices o-ray and e-ray in quartz crystal (double refraction)
5. Calculation of Cauchy's constants of the material of the prism using spectrometer.
6. Determination of band gap of semiconductor (thermistor) by varying resistance with temperature
7. Verification of laws of resistance and determination of specific resistance of wire by using Carey- Foster's bridge.
8. Calibration of a low-range voltmeter using potentiometer.
9. Study of variation of magnetic field along the axis of a current carrying circular coil – Stewart and Gee's apparatus
10. Evaluation of moment of inertia by using Flywheel
11. Estimation of rigidity modulus and moment of inertia using Torsional pendulum
12. Find the Numerical aperture of a given optical fibre
13. Determination of the velocity of ultrasound in liquids by using the phenomenon of diffraction of light by ultrasound
14. Estimation of the wavelength of diode laser using a transmission grating
15. Determination of Planck's constant

Beyond the Syllabus Experiments:

1. Determination of the particle size of micro particles (lycopodium powder) using laser diffracting grating.
2. Measurement of dielectric constant with temperature variation (Ba TiO_3)
3. Magnetic Hysteresis curve experiment (B-H curve)
4. Determination of Resolving power of the Grating
5. Determination of the frequency of an electrically maintained tuning fork - Melde's experiment.

Learning Outcomes:

The students will be able to

- **Handle** optical instruments like microscope and spectrometer
- **Determine** thickness of a hair/paper with the concept of interference
- **Estimate** the wavelength and resolving power of different colours using diffraction grating
- **Plot** the intensity of the magnetic field of circular coil carrying current with varying distance
- **Determine** the band gap of a given semiconductor
- **Evaluate** the acceptance angle of an optical fiber and numerical aperture
- **Determine** resistance and resistivity of the given material
- **Plot** the accuracy / correction of low range voltmeter using potentiometer
- **Evaluate** the refractive index using double refraction phenomena
- **Determine** frequency of electrically maintained tuning fork
- **Evaluate** the loss of energy in magnetic materials

Prescribed Book

1. Physics Laboratory Manual Prepared by Department of Physics ANITS

Reference books

1. D.P Siva Ramaiah and V. Krishna Murthy, “Practical Physics”, Maruti book Depot, 2000.

2. A.R Vegi, “Comprehensive Practical Physics”, Vegi Publishers Pvt. Ltd., 2004.

PROBLEM SOLVING AND PROGRAMMING USING C LAB

(Common to CSE, IT, Civil, EEE, ECE, Mechanical and Chemical)

Course Code: 23CS3201 **Credits : 1.5**

Instruction **:** L - 0, T- 0 P – 3 Sessional Marks : 50

End Exam : 3 Hours End Exam Marks : 50

Course Objectives:

1. To learn how to solve a given problem.
2. To illustrate the basic concepts of C programming language.
3. To discuss the concepts of Functions, Arrays, Pointers and Dynamic MemoryAllocation.
4. To understand and implement Structures and Unions.

Course Outcomes

After course completion, the students will be able to:

1	Develop an algorithm and flowchart by applying various control structures to solve real world problems
2	Apply iterative statements, arrays and modular programming to solve the complex problems
3	Implement Programs using pointers and String handling Functions.
4	Develop code for complex applications using structures, unions.

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	2							2		
CO2	3	3	3	3	3	2							2	1	
CO3	3	3	3	3	3	2							2	1	
CO4	3	3	3	3	3	2							2	1	

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO-PO-PSO Justification	
1	CO1 equips students with essential problem-solving abilities using algorithms, control structures, and flowcharts while integrating engineering principles and ethical considerations.
2	CO2 can be attained by equipping students with essential programming techniques and problem-solving abilities, thereby preparing them to contribute effectively to the engineering field, society, and their professional development.
3	CO3 can be attained by enabling students to develop comprehensive expertise in utilizing pointers for efficient problem-solving while integrating a broad range of essential engineering and programming competencies with a societal context.
4	CO4 can be attained by aligning with the broader objectives of engineering knowledge application, problem analysis, design/development of solutions, and investigation of complex problems, modern tool usage, and consideration of societal and ethical responsibilities in professional engineering practice in progressive manner.

SYLLABUS

Week-1: Draw flowcharts for fundamental algorithms.

Week-2: C Programs to demonstrate C-tokens.

Week-3: C Programs on usage of operators.

Week-4: C Programs to demonstrate Decision making and branching (Selection).

Week-5: C Programs to demonstrate different loops.

Week-6: C Programs to demonstrate 1-D arrays.

Week-7: C Programs to demonstrate multi-dimensional arrays.

Week-8: C Programs to demonstrate functions.

Week-9: C Programs on pointers.

Week-10: C Programs to perform operations on Strings with String handling functions and without String handling functions.

Week-11: C Programs on Structures and Unions.

Week-12: C Programs to demonstrate Files.

Text Books:

1. R.G. Dromey, How to Solve it by Computer, 1/e, Pearson Education, 2006.
2. Reema Thareja, Programming in C, Oxford University Press, AICTE Edition, 2018.

Reference Books:

1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, 3/e, Cengage Learning, 2007.
2. Pradip Dey, Manas Ghosh, Programming in C, Oxford University Press, AICTE Edition,
3. B. Gottfried, Programming with C, 3/e, Schaum's outlines, McGraw Hill (India), 2017.
4. Jeri R. Hanly, Ellot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson.

ENGINEERING AND IT WORKSHOP

(CHEM, CSD, CSM, EEE, IT)

Course Code: 23ME3202 **Credits:**1.5

Instruction : 3 Practical/Week Sessional Marks:50

End Exam : 3 Hours End Exam Marks:50

Prerequisites: Nil

Course Objectives:

- To provide training and hands on experience to the students on basic Engineering relatedskills like carpentry, fitting, tin smithy and house wiring
- Explain the internal parts of a computer, peripherals, I/O ports, connecting Cables.
- Demonstrate OS installation and Hardware Troubleshooting.
- Demonstrate Office Tools such as Word processors, Spread-sheets, and Presentation.

Course Outcomes:

By the end of the course, students will be able to

1.	**Produce** a variety of carpentry, fitting and Tin Smithy jobs.
2.	**Prepare** electrical circuits for Series & Parallel connection and Stair case wiring.
3.	**Demonstrate** the capability of OS installation, network connectivity and Hardware Troubleshooting
4.	**Draft, present** and **perform** analyses on a given problem using MS-office tools

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2						1							
CO2	1	2						1							
CO3	1	2		2				1	1						
CO4	1	3			1			1	1	2		2			

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO-PO-PSO Justification	
1	CO-1 satisfies only competency-1.4, so it is mapped to PO-1 at low level. As CO-1 satisfies two competencies (2.3 & 2.4), it is mapped at medium level to PO-2. As CO-1 satisfies one competency (8.1), it is mapped at low level to PO-8.
2	CO-2 satisfies only competency-1.4, so it is mapped to PO-1 at low level. As CO-2 satisfies two competencies (2.3 & 2.4), it is mapped at medium level to PO-2. As CO-2 satisfies one competency (8.1), it is mapped at low level to PO-8.

3	CO-3 satisfies only competency-1.4, so it is mapped to PO-1 at low level. CO-3 satisfies two competencies- (2.1 & 2.2) so it is mapped to PO-2 at medium level. As CO-3 satisfies one competency-4.1& 4.3, it is mapped at medium level to PO-4. As CO-3 satisfies one competency (8.1), it is mapped at low level to PO-8. As CO-3 satisfies one competency-9.1, it is mapped at low level to PO-9.
4	CO-4 satisfies only competency-1.4, so it is mapped to PO-1 at low level. As CO-4 satisfies three competencies- (2.2, 2.3 & 2.4) it is mapped at high level to PO-2. As CO-4 satisfies one competency (5.1), it is mapped at low level to PO-5. As CO-4 satisfies one competency (8.1), it is mapped at low level to PO-8. As CO-4 satisfies one competency-9.1, it is mapped at low level to PO-9. As CO-4 satisfies two competencies-(10.1 & 10.2), it is mapped at medium level to PO-10. As CO-4 satisfies two competencies-(12.2 & 12.3) it is mapped at medium level to PO-12.

ENGINEERING WORKSHOP SYLLABUS

LIST OF EXPERIMENTS

Carpentry	1. Cross Lap Joint
	2. Dovetail Joint
Fitting	1. V Fit
	2. Square Fit
Tin Smithy	1. Taper Tray
	2. Square Box without lid
House Wiring	1. Parallel / Series Connection of three bulbs
	2. Stair Case wiring

Reference book:

1. **S. K. Hajra Choudhury** "*Elements of Workshop Technology" Vol I Manufacturing Processes,* ISBN:8185099146(2017).
2. **Lab Manual**

IT WORKSHOP SYLLABUS

Week 1: Introduction to PC Hardware **CO3**

Types of Computing Devices such as PC, Laptops, Servers, Smart Phones, Tablets, other accessories, PC parts, Input/Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Week 2: **CO3**

Task 1: OS Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

Task 2: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Week 3: **CO3**

Task 1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate how to access the websites and email.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers.

Week 4: MS word & PowerPoint Presentation **CO4**

Task 1: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.

Task 2: create basic power point presentation: PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and Charts.

Week 5: Spreadsheet Orientation: **CO4**

Accessing, overview of toolbars, saving spreadsheet files, Using help and resources, Format Cells, Summation, auto fill, Formatting Text, Calculating GPA, Features to be covered: - Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.

Case Study:

1. Create Department Newsletter of Latest academic year.
2. Create a presentation on short term goals vs long term goals.
3. Perform result analysis

Reference Books:

1. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
2. MOS Study Guide for Microsoft Word, Excel, Power point & Outlook by Joan Lambert & Joyce Cox

ENVIRONMENTAL SCIENCE

Mandatory (Non Credit) course for all branches

Course Code: 23MC0102 **Credits:** 0

Lecture hours: 3 per week Sessional Marks: 50

Prerequisites: +1 & +2

COURSE OBJECTIVES:

- Inculcating in students the awareness toward components in environment
- Understand the importance natural resources, Structure, and functions of an ecosystem
- Inducing knowledge on Sources, effects, and methods to reduce environmental pollution
- Able to know the meaning of sustainable development and correlate social issues related to environment.

Course Outcomes:

By the end of the semester, the student will beable to:

CO	Statement
CO-1	Identify the characteristics of various natural resourcesand can implement the conservation practices
CO-2	Realize the importance of Ecosystem and Biodiversityfor maintaining ecological balance
CO-3	Classify, analyze various pollutants and can develop methods for solving problems related to environment
CO-4	Implement the environmental laws or defend issuesby getting awareness on legal aspects related to environmental issues
CO-5	Promote awareness on local environmental issues by participating in group activities, seminars, takingproject work

CO-PO-PSO Mapping

PO/CO's	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1						1	2	1		1		1		
CO2						1	2	1		1		1		
CO3						2	2	1		1		1		
CO4						2	3	1		1		1		
CO5						2	2	1	3	2		1		

Correlation levels: 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

CO-PO-PSO justification	
1	Understand the scope of environmental science. Can Elaborate their knowledge over Natural resources their conservation practices.
2	Apply knowledge of structure and functions of Ecosystem in various applications. Able to gain knowledge over values of biodiversity.
3	Acquire knowledge on sources, effects of various pollutants and also understand the advanced methodologies to reduce contamination
4	Correlate social issues caused due to environmental changes and can plan for solutions for society related problems

UNIT I

INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES [8 Periods]

Introduction: Definition, Multidisciplinary nature of environmental studies, Scope and Importance of Environmental Sciences, Need for public awareness.

Natural Resources: Renewable and Non-Renewable resources- Forest resources-use and overexploitation, deforestation, Water resources- aquifers, dams and benefits, conflicts over water; Food resources- effects of modern agriculture practices, Energy resources-conventional and non -conventional energy resources.

Activities:

Need for Public Awareness (Campaign), Renewable vs. Non-Renewable Resources (Group Discussion), Deforestation and its Impact, Water Conflict (Case studies)

UNIT- II

ECOSYSTEM & BIO DIVERSITY [8 Periods]

Ecosystem: Concept of an ecosystem-structure and function of an ecosystem Food chains, food webs and ecological pyramids, Energy flow in an ecosystem, Ecosystem regulation, Ecological succession.

Biodiversity: Definition, types, India as a Mega diversity Nation, Values of biodiversity, Hot spots of biodiversity, Threats to biodiversity, Endangered and endemic species, Conservation of biodiversity.

Activities:

Ecosystem (Field trip), Food chain and Food Web (Models), Endangered Species (Case Studies), Ecosystem regulation, Values of Biodiversity (Group Discussion), Endangered Species Awareness (Poster presentation)

UNIT -III

ENVIRONMETAL POLLUTION AND WASTE MANAGEMENT [8 Periods]

Pollution: Sources, effects and control measures of Air pollution, Noise Pollution, Water Pollution, Soil Pollution, Radio Active Pollution; Climate Change, Ozone depletion, Acid rains – causes and adverse effects.

Solid waste management: Sources and effects of municipal waste, bio-medical waste, Industrial waste, e- waste, Process of waste management-composting, sanitary landfills, incineration. Green Chemistry concepts,

Activities:

Pollution (Slogan writing), Pollution Control Measures (Group Discussion), Climate Change (Case Studies), Waste-to-Art (Poster presentation)

UNIT- IV

SOCIAL ISSUES AND ENVIRONMENTAL LEGISLATIONS [8 Periods]

Social Issues and the Environment: Sustainable development, Environmental Impact Assessment, Rain water harvesting, water shed management. Resettlement and rehabilitation of people, Environmental ethics

Legislation Acts: Importance of Environmental legislation, Air (Prevention and Control of Pollution) act, Water (Prevention and control of Pollution) act, Wildlife Protection act, Forest Conservation act.

Activities:

Sustainable Development, Environmental Ethics (Group Discussion), Environmental Impact Assessment (EIA), Resettlement and Rehabilitation (Case Studies), Rainwater Harvesting (Model), Environmental Legislation (Awareness Campaign)

UNIT- V

HUMAN POPULATION AND THE ENVIRONMENT [5 Periods]

Human population and environment- Population growth, Population explosion; Family Welfare Programmes; Role of information technology on environment and human health; Value Education – HIV/AIDS – Women andChild Welfare

FIELD WORK/PROJECT: Visit to a local area to document environmental problem and submit a Record

Activities:

Population Growth, Role of Information Technology and Environment, Women Empowerment, Family Welfare Program (Awareness Campaign), Women and Child Welfare (Case Study), Population and Environment (Short film)

Text Books:

1. **Anubha Kaushik & C.P.Kaushik**, "Perspectives of Environmental Studies" by 5th edition New AgeInternational Publications, 2015.
2. **Erach Bharucha** Text book of "Environmental Studies for Undergraduate Courses", universities PressCommission, 2013.
3. **Palaniswamy**- "Environmental Studies", 2nd edition, Pearson education 2015.

Reference Books

1. **S. Deswal, A. Deswal**, "Basic course in Environmental studies", 2nd edition, Dhanpat Rai Publications, 2008.

ORDINARY DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS

Course Code:23MA1102 **Credits:**3

Instruction : 3 periods & 1 Tutorial/Week Sessional Marks:40
End Exam : 3 Hours End Exam Marks:60

Prerequisites: Matrices, Differentiation, Differential equations, Integration and Functions.

Course Objectives:

Create and analyze mathematical models using first and higher order differential equations to solve application problems such as electrical circuits, orthogonal trajectories and Newton's law of cooling and also familiarize the student in various topics in numerical analysis such as interpolation, numerical differentiation, integration and direct methods for solving linear system equations.

Course Outcomes: By the end of the course, students will be able to

1.	Demonstrate solutions to first order differential equations by various methods and solve basic application problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling.
2.	Discriminate among the structure and procedure of solving higher order differential equations with constant coefficients and variable coefficients.
3.	Apply various numerical methods to solve linear and non-linear equations.
4.	Familiarize with numerical integration and differentiation.
5.	Understand Laplace transforms and its properties, and finding the solution of ordinary differential equations.

CO-PO –PSO Mapping:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1							1	2			
CO2	3	2	1	1							1	2			
CO3	3	2	1	1							1	2			
CO4	3	2	1	1							1	2			
CO5	3	2	1	1							1	2			

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO-PO-PSO Justification	
1	CO1 is widely used to solve complex engineering problems in all the areas like Fluid dynamics, Mass transfer, Signals and Systems, and Dynamics.
2	CO2 is widely used to solve complex engineering problems in all the areas like Fluid dynamics, Mass transfer, Signals and Systems, and Dynamics.
3	CO3 deals with the techniques that are used to find an approximate real root of the given algebraic and transcendental equations.
4	CO4 deals with the knowledge of interpolation, numerical differentiation and integration, which is used all the areas of engineering sciences.
5	CO5 deals with the knowledge of Laplace transforms which are widely used in all the areas of engineering sciences.

SYLLABUS

UNIT I **[10 Periods]**

Ordinary differential equations of first order and its applications : Linear equations - Bernoulli's equations - Exact differential equations - Equations reducible to exact equations - Orthogonal trajectories - Simple electric circuits (L –R circuit problems) - Newton's law of cooling.

Sections: 11.9, 11.10, 11.11, 11.12, 12.3, 12.5 and 12.6.

UNIT II **[10 Periods]**

Higher order linear differential equations and its applications : Definitions - Operator D - Rules for finding the complementary function - Rules for finding the particular integral - Method of variation of parameters - Equations reducible to linear equations with constant coefficients: Cauchy's homogeneous linear equation - Legendre's linear equation. Applications**:** L – C – R circuit problems.

Sections: 13.1, 13.3, 13.4, 13.6, 13.8(I), 13.9, 14.5(ii).

UNIT III **[10 Periods]**

Numerical solutions of algebraic and transcendental equations :

Solution of algebraic and transcendental equations: Bisection method - Regula-Falsi method - Newton-Raphson method.

Solution of linear simultaneous equations: Gauss elimination - Gauss Jordan - Gauss Seidel.

Sections: 28.2, 28.3, 28.5, 28.6(1,2), 28.7(2)

UNIT IV **[10 Periods]**

Interpolation, Numerical Differentiation and Integration: Finite differences - Other difference operators - Relation between operators - To find one or more missing terms - Newton's interpolation formulae. Interpolation with unequal intervals: Lagrange's interpolation formula.

Numerical differentiation: Newton's forward and backward differences formula to compute first and second derivatives**.**

Numerical integration: Trapezoidal rule - Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Sections: 29.1(1, 2), 29.4(i), 29.5, 29.6(1,2), 29.9, 29.10, 30.2(1,2), 30.6, 30.7, 30.8.

UNIT V **[10 Periods]**

Laplace Transforms and its applications: Introduction - Definitions - Transforms of elementary functions - properties of Laplace transforms - Transforms of periodic functions - Transforms of derivatives - Transforms of integrals - Multiplication by t^n - Division by t – (All properties without proofs) - Evaluation of integrals by Laplace transforms.

Inverse transforms – method of partial fractions - Other methods of finding inverse transforms - Convolution theorem (without proof) - Application's to differential equations - Unit step function and unit impulsive functions.

Sections: 21.1, 21.2, 21.3, 21.4, 21.5, 21.7, 21.8, 21.9, 21.10, 21.11, 21.12, 21.13, 21.14, 21.15, 21.17 and 21.18.

TEXT BOOKS:

1. **B. S. Grewal**, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

REFERENCE BOOKS:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. **N. P. Bali**, Engineering Mathematics, Lakshmi Publications.
3. **George B. Thomas, Maurice D. Weir and Joel Hass**, Thomas, Calculus, 13/e, Pearson Publishers, 2013.
4. **H. K. Das**, Advanced Engineering Mathematics, S. Chand and company Pvt. Ltd.
5. **Michael Greenberg** Advanced Engineering Mathematics, Pearson, Second Edition.

COMMUNICATIVE ENGLISH

Course Code: 23EN2101 **Credits:**3
Instruction : 3 periods & 1 Tutorial/Week Sessional Marks:40
End Exam : 3 Hours End Exam Marks:60
Prerequisites: Basic English grammar

Course Objectives:

1. To develop awareness about the importance of LSRW skills
2. To implement verbal and nonverbal cues properly in their career and personal life
3. To prepare the students impress everyone with their effective communication skills
4. To familiarize the students with latest terminology and jargon.
5. To train them to attempt various vocabulary tests to get employment.

Course Outcomes:

1.	Comprehend LSRW skills and various linguistic aspects of multicultural milieu.**(L2)**
2.	Acquire verbal and nonverbal Communication skills through varied individual and team activities. **(L3)**
3.	Apply proper vocabulary and appropriate grammar to draft different types of writings collectively and separately for effective professional and personal communication**. (L3)**
4.	Analyze and relate advanced terminology in conceptual conversations, writings and in pronunciation. **(L4)**
5.	Distinguish and practice several kinds of vocabulary tests for better employability with competence. **(L4)**

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1									M	M		M		2	
CO2									M	M		M		2	
CO3									M	M		M		2	
CO4									M	M		M		2	
CO5									M	M		M		2	

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO-PO-PSO Justification	
1	CO1 is mapped with PO 9,10, and 12 as many of the LSRW skills are related to both individual performance and team activity-based. Students can use language in multicultural and multidisciplinary events with effective communication skills. It's a life-long learning.
2	CO2 is mapped with PO 9, 10 and 12 as students do activities in teams and individually to get effective communication skills and learn new avenues of English language.
3	CO3 is mapped with PO 9, 10 and 12 as effective writing skills and communication skills are developed through group activities and individual presentations.
4	CO4 is mapped with PO 9,10, and 12 as using new vocabulary or terminology is needed for collective and single performances
5	CO5 is mapped with PO 9,10, and 12 as language exercises are done in groups and in isolated tests which develop students' oral and written communication skills.

SYLLABUS

UNIT I **[10 Periods]**

Listening: Motivational Speech (Martin Luther King, Jr. Dr. Abdul Kalam, Sundar Pitchai)

Speaking: Self Introduction – Introducing others

Reading: Motivational Speech or Essays (H G Wells, Stephen Hawking)

Writing: Paragraph Writing - Letter Writing – Profile Building

Grammar: Types of Sentences – Assertive, Interrogative, Imperative and Exclamatory - Phrases & Clauses - Verb Forms

Vocabulary: Root words – Foreign words and Phrases **CO1**

UNIT II **[10 Periods]**

Listening: TED Talks - Can global food companies make the shift to regenerative agriculture?

Speaking: Basics of Communication - Verbal, Nonverbal - Oral talk on selected topics (Women empowerment and gender issues) - Extempore

Reading: Newspaper reading

Writing: Written Communication – Essay Writing – Assertive essays

Grammar: Tenses - Agreement: Subject-verb, Noun-pronoun – Articles – Prepositions

Vocabulary: One-word Substitutes – Word Associations – Portmanteau Words **CO2**

UNIT III **[10 Periods]**

Listening: Poems – Sonnets and Haikus
Speaking: Presenting point of view on current affairs
Reading: Editorials reading
Writing: Writing structured, analytical and argumentative essays on general topics
Grammar: Active & Passive Voice, Use of Passive Verbs in Academic Writing - Discourse Markers or Transition Words
Vocabulary: Modifiers and Misplaced Modifiers–Academic words– Synonyms–Antonyms **CO3**

UNIT IV **[10 Periods]**

Listening: Role-plays
Speaking: Debate
Reading: Skimming and Scanning - Failure to Success Stories (KFC, J K Rowling, Walt Disney)
Writing: Summary
Grammar: Direct and Indirect Speech – Degrees of Comparison
Vocabulary: Homonyms & Homophones – Collocations – Etymology **CO4**

UNIT V **[10 Periods]**

Listening: News Bulletins- Recycle for Life: Karaikal's success in battling waste
Speaking: Mock Press, Floor Crossing
Reading: The role of Social Media analytics in new-age Digital Market-
Writing: Resume Writing – Dialogue Writing
Grammar: Quantifiers, Prescribed Phrases – Correction of Sentences
Vocabulary: Affixation – Paronyms – Acronyms – Word Building **CO5**

***Note-** Additional topics that can be introduced during the course but are out of the prescribed syllabus.

TEXT BOOKS:

1. **Text book prepared by the faculty of English, ANITS**

REFERENCE BOOKS:

1. Bailey, Stephen. *Academic writing: A handbook for international students*, Rutledge, 2014.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewing's, Martin. *Cambridge Academic English (B2)*. CUP, 2012(Student Book, Teacher Resource Book, CD & DVD).
4. Varma, Shalini. *Body Language: Your Success Mantra*. Amazon: India, 2005

E-Resources

language.com
http://www.5minuteenglish.com/https://www.englishpractice.com/
Grammar/Vocabulary English Language Learning Online;
http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/;
http://www.nonstopenglish.com/
https://www.vocabulary.com/;
BBC Vocabulary Games
Free Rice Vocabulary Game
Reading
https://www.usingenglish.com/comprehension/;
https://www.englishclub.com/reading/short-stories.htm;
https://www.english-online.at/All Skills
https://www.englishclub.com/; http://www.world-english.org/http://learnenglish.britishcouncil.org/
Online Dictionaries
Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

Listening:

Unit-I-
https://www.ted.com/talks/steve_presley_can_global_food_companies_make_the_shift_to_regenerative_agriculture

Unit-V- https://www.youtube.com/watch?v=_YlNmkbsL74&t=2s
https://www.ourbetterworld.org/series/environment/story/working-hand-in-hand-for-change?utm_source=taboola&utm_medium=indianexpress-indianexpress&utm_content=Watch+Hand+In+Hand+India+Make+Waste+Work&utm_campaign=OBW_ENV_SERIES_2022#tblciGiBX-q8Y7DpgDlPlmvjD7pcLI4ECqb3eMNOy27aIpILTMiCPuj0ogbbDp9K5kf2cAQ

Reading:

Unit-V-The role of Social Media-
https://timesofindia.indiatimes.com/education/upskill/the-role-of-social-media-analytics-in-new-age-digital-marketing/articleshow/101944496.cms

ENGINEERING CHEMISTRY

(EEE, Mech, ECE, Chemical students)

Course Code: 23CY1101 **Credits**: 3

Instruction: 3 periods/ 1 Tutorial per week Sessional marks:40

End exam: 3 hours End exam marks:60

Prerequisites: Chemistry at +1 and +2 level

Course Objective:

1. Equip students with essential knowledge and skills to assess, treat, and sustain water quality, emphasizing the importance of healthier communities and promoting sustainable water management practices.
2. Provide students with a comprehensive understanding of electrochemistry and its diverse applications. Prepare them for careers and research in energy-related fields, emphasizing sustainable technologies and their role in addressing global energy challenges.
3. Enhance students' comprehension of corrosion processes and their detrimental effects on structures and machinery, while equipping them with a wide range of corrosion protection methods to ensure the longevity and durability of engineering components.
4. Empower students with comprehensive knowledge and practical skills in analyzing energy sources, implementing efficient combustion practices, and fostering sustainable energy solutions to contribute towards a greener and more sustainable world.
5. Provide students with a strong foundation in plastics technology, covering various fabrication methods, and enabling them to identify and select appropriate plastics for specific engineering applications, considering their mechanical, thermal, and environmental properties.

Course Outcomes

By the end of the course, students will be able to

CO No.	Statement
1	Assess and contrast water treatment methods, analyse intricate challenges related to water impurities, hardness, boiler issues, and corrosion, and devise efficient, cost-effective, and environmentally conscious solutions.
2	Analyse and evaluate the appropriateness of battery technologies and solar cell knowledge for specific requirements and contexts, demonstrating expertise in energy storage and sustainable energy applications.
3	Assess the effects of corrosion on structures and equipment, exploring corrosion theories, types, and influential factors. Formulate effective corrosion protection strategies based on evaluating the efficiency of various protection methods.
4	Employ formulas and calculations for solving complex combustion-related numerical problems, and critically evaluate and propose innovative solutions for challenges in biodiesel production and utilization.
5	Critically analyse plastics' properties, fabrication techniques, and engineering applications. Evaluate the potential of Fiber Reinforced Polymer Composites (FRPC) in advanced applications like sensors and self-cleaning windows.

CO-PO-PSO Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2				1	1	1				1
2	3					1	1	1				1
3	3	1				1	1	1				1
4	3	1				1	1	1				1
5	3					1	1	1				1

Correlation levels: 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

CO-PO-PSO justification	
1	Understand drawbacks of hard water, and make informed decisions on water quality for domestic and industrial settings.
2	Evaluate and synthesize knowledge of electrode potentials, battery technologies, fuel cells, and solar cells, applying critical thinking to propose innovative solutions for advancements in energy storage and sustainable energy applications.
3	Critically assess the efficiency of corrosion protection methods and advanced coating technologies. Formulate suitable corrosion protection strategies for a variety of structures and applications based on the evaluation
4	Retrieve fundamental knowledge about calorific value, methods for determining the calorific value of solid and gaseous fuels, and the process of petroleum refining
5	Apply the knowledge of plastics and their properties to select appropriate materials for specific engineering applications and principles of plastic fabrication techniques to design and manufacture products

SYLLABUS

UNIT-I Water Technology **[10 Periods]**

Impurities in water - Specifications of water for domestic use (ICMR and WHO) - Hardness- Types, units of hardness, Numerical problems on hardness, Disadvantages in using hard water; Boiler troubles- Sludge & Scale formation, Internal Treatment (Carbonate, Phosphate & Calgon conditioning methods), Boiler corrosion.

Water softening method - Ion exchange resin process, advantages & disadvantages; Desalination methods - Reverse Osmosis & Electro dialysis

Municipal water treatment - Sedimentation with coagulation, Sterilisation - Chlorination (break point chlorination), UV treatment

UNIT-II Energy Storage Systems **[10 periods]**

Introduction to Electrode potentials, Electro Chemical Series; Batteries - Primary battery - Dry Cell, Secondary battery - Lead Acid battery, Lithium-ion batteries; Fuel cells - Hydrogen -Oxygen fuel cells, Applications.

Advanced batteries for Electrical vehicles - Lithium iron phosphate, Solid state battery - advantages & applications; Solar cells – Types - Polycrystalline and Thin film Solar cells, Principle, Working and Applications.

UNIT-III Corrosion and its prevention **[10 Periods]**

Corrosion & detrimental effects on buildings, machines, equipment's -Theories of corrosion - Dry and wet corrosion; Types of corrosion - Galvanic corrosion, Concentration cell corrosion, Illustrations; Factors influencing corrosion.

Corrosion protection - Cathodic protection – sacrificial anodic and impressed current cathodic protection methods; Metallic coatings - electroplating of copper and electroless Nickel plating, Basic Concepts of Physical Vapour Deposition coating (PVD) and Chemical Vapour Deposition coating (CVD)

UNIT-IV Fuels and Combustion **[10 periods]**

Introduction; Calorific Value – Lower Calorific Value, Higher Calorific Value, Determination of Calorific Value of solid fuel using Bomb Calorimeter and Gaseous fuel using Boy's Calorimeter - Numerical Problems on Combustion.

Petroleum- Refining of petroleum - Synthetic petrol - Bergius process – Fischer-Tropsch process -Biodiesel.

UNIT-V Polymer Technology **[10 Periods]**

Introduction - Distinction between Thermoplastics and Thermosetting plastics; Preparation, Properties & Engineering applications of plastics – Poly Vinyl Chloride (PVC), Teflon, Bakelite, and Acrylo Butadiene Styrene (ABS).

p Cases), Injection moulding (Car parts, bottle caps), Transfer moulding, Extrusion moulding (Pipes Hoses), Battery Trays), blown film moulding (PET bottles); Fibre Reinforced Polymer Composites (FRPC) - Applications of polymers in sensors, self-cleaning windows.

Prescribed books

1. P. C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai & Sons , New Delhi.

Reference books

1. S.S.Dara ,"A text book of Engineering Chemistry" S.Chand & Co New Delhi.
2. Dell, Ronald M Rand, David A J, "Understanding Batteries", Royal society of Chemistry

DIGITAL LOGIC DESIGN

(Common for EEE, CSE, CSM, CSD, IT)

Course Code: 23EC3103 **Credits:** 3

Instruction: 3 periods &1 Tut/Week Sessional marks: 40

End exam: 3hours End exam marks: 60

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL-3	Perform conversions between different number systems and codes and apply the Boolean algebra to minimize the given logic expressions.
CO2	BL-3	Minimize the given Boolean expressions using logic gates and K-Maps
CO3	BL-4	Design and Analyze combinational logic circuits.
CO4	BL-4	Design and Analyze sequential logic circuits like flip-flops and registers
CO5	BL-3	Design and Analyze counters logic circuits and PLDs

Program Matrix

COs	Program Outcomes (POs)												PSOs			Justification
	Domain Specific POs					Domain Independent POs										
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	1	1	1	-	-	-	-	-	-	-	-	1	-	-	1	P1.2.1, P1.3.1, P2.1.2, P2.1.3, P3.2.1,P12.1.1,
CO2	2	2	2	-	-	-	-	-	-	-	-	1	-	-	1	P1.3.1, P1.4.1, P2.1.2, P2.1.3, P2.2.3, P3.2.1, P3.2.3, P12.1.1
CO3	2	2	2	-	-	-	-	-	-	-	-	1	-	-	1	P1.2.1, P1.3.1, P2.4.1, P3.2.1, P3.2.3,P12.1.1
CO4	2	2	2	-	-	-	-	-	-	-	-	1	-	-	1	P1.3.1, P1.4.1,P2.1.2, P2.1.3, P2.2.3, P3.2.1, P3.2.3, P12.1.1
CO5	2	2	2	-	-	-	-	-	-	-	-	1	-	-	1	P1.3.1, P1.4.1, P2.1.2, P2.1.3, P2.2.3, P3.2.1, P3.2.3,P12.1.1

Justification of CO mapping with POs and PSOs

Course outcome	PO Mapped	Level Mapped	Justification for Mapping
CO1	PO1	1	Student will be able to apply the knowledge of basic engineering sciences, core engineering in designing various digital systems.
	PO2	1	Able to identify, analyse the problems in digital domain.
	PO3	1	Able to apply the knowledge of number systems and conversions in developing digital systems and related projects
	PO12	1	Able to apply the knowledge of digital concepts in developing the new technologies s and their outcomes in multidisciplinary areas.
	PSO3	1	Apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of embedded and VLSI and communicate them effectively to the concern.

CO2	PO1	2	Student will be able to apply the knowledge of core engineering to compute the concept in modelling and designing computer based systems.
	PO2	2	Able to identify, analyze the problems in different domains
	PO3	2	Able to apply the knowledge of engineering to develop and assess projects and their outcomes in multidisciplinary areas.
	PO12	1	Able to apply the knowledge of digital concepts in developing the new technologies s and their outcomes in multidisciplinary areas.
	PSO3	1	Apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of embedded and VLSI and communicate them effectively to the concern.
CO3	PO1	2	Student will be able to apply the knowledge of engineering sciences, core engineering concepts in designing computer based systems.
	PO2	2	Able to identify, analyze the complex problems in different domains.
	PO3	2	Able to apply the knowledge of combinational circuits in designing digital systems and assess projects in multidisciplinary areas.
	PO12	1	Able to apply the knowledge of digital concepts in developing the new technologies s and their outcomes in multidisciplinary areas.
	PSO3	1	Apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of embedded and VLSI and communicate them effectively to the concern.
CO4	PO1	2	Student will be able to apply the knowledge of engineering sciences, core engineering and computing concept in designing computer based systems.
	PO2	2	Able to identify, analyze the problems in different domains
	PO3	2	Able to apply the knowledge of sequential circuits in designing digital systems and projects and their outcomes in multidisciplinary areas.
	PO12	1	Able to apply the knowledge of digital concepts in developing the new technologies s and their outcomes in multidisciplinary areas.
	PSO3	1	Apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of embedded and VLSI and communicate them effectively to the concern.
CO5	PO1	2	Student will be able to apply the knowledge of engineering sciences, core engineering and computing concept in designing computer based systems.
	PO2	2	Able to identify, analyse the problems in different domains
	PO3	2	Able to apply the knowledge of counters and PLDs in designing digital systems and assess projects and their outcomes in multidisciplinary areas.
	PO12	1	Able to apply the knowledge of digital concepts in developing the new technologies s and their outcomes in multidisciplinary areas.
	PSO3	1	Apply the knowledge of engineering fundamentals to formulate, analyse and provide appropriate problem solving strategies in the field of embedded and VLSI and communicate them effectively to the concern.

SYLLABUS

UNIT –I **[10Periods]**

NUMBER SYSTEMS

Number representation, Conversion of bases, Binary Arithmetic, Representation of Negative numbers, Binary codes: weighted and non-weighted BOOLEAN ALGEBRA: Basic definitions, Axiomatic Definitions, Theorems and properties, Boolean Functions, Canonical and standard forms.
(TB1-chapters1&2)

UNIT– II **[10Periods]**

LOGIC GATES- AND, OR, NAND, NOR, XOR,XNOR (**TB2-chapter 4)**

LOGICMINIMIZATION

The K-Map Method: Two variable map, Three variable map, four variable map Prime Implicants, Don't Care conditions, NAND and NOR implementation, Quine-Mccluskey (QM) (up to four variables) Technique.(**TB1-chapters3)**

UNIT– III **[10Periods]**

COMBINATIONAL LOGIC DESIGN

Combinational circuits, Analysis Procedure, Design Procedure, Code Converters (BCD to XS3 (XS3 to BCD)), Gray to Binary (Binary to Gray), Binary Adder-Subtractor, Decimal adder, Binary Multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers. De-Multiplexer
(TB1-chapters 4&9.7)

UNIT– IV **[10Periods]**

SEQUENTIAL CIRCUITS-1

Sequential logic- Introduction to Latch and Flip flop, clocked S-R, JK, D, T flip flops. Excitation table of Flip flop, Flip flop conversion, Clocked flip flop design, Edge triggered flip flop
Registers, Applications of Shift registers, universal shift register,**(TB2-chapters7&8(till8.5))**

UNIT –V **[10Periods]**

SEQUENTIAL CIRCUITS-2

Counters- Ripple counters, Synchronous counters, Ring counters, Johnson counter.
PLD's- PAL, PLA and PROM

TEXTBOOKS

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 6th Edition, Pearson Publishers,2018.
2. R. P Jain, "Modern Digital Electronics", 5th Edition, TMH, 2022.

REFERENCEBOOKS

1. William I. Fletcher, "An Engineering Approach to Digital Design", PHI, 2015.
2. John F. Wakerly, "Digital Design Principles and Practices", 3rd Edition, Prentice Hall,2015

ENGINEERING MECHANICS & STRENGTH OF MATERIALS

Course Code: 23ME3104 **Credits:**3
Instruction : 2 periods & 1 Tutorial/Week Sessional Marks:40
End Exam : 3 Hours End Exam Marks:60

Prerequisites: Requires the knowledge of Engineering Mathematics.

Course Outcomes:

By the end of the course, students will be able to

1. **Compute** the resultant of coplanar-concurrent force system, **Apply** the concept of free body diagram to **evaluate** the static equilibrium of bodies and further **apply** the laws of dry friction.
2. **Compute** the centroid of plane figures and center of gravity of 2D and 3D bodies.
3. **Compute** the kinematic parameters in rectilinear translatory motion and also apply Newton's Laws of Motion and kinetic principles to bodies in linear motion.
4. **Elucidate** the stress-strain curve of different materials and evaluate the stresses and strains under simple loading conditions.
5. **Compute** the Torsional stresses in shafts.

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3	2	1										2		
CO2	3	2	1										2		
CO3	3	2	1										2		
CO4	3	2	1										2		
CO5	3	2	1										2		

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

CO-PO-PSO Justification	
1	CO1 deals with Laws of Equilibrium, principles & theorems of Static Force system which are the core engineering knowledge and uses complex mathematical formulations, so it is mapped to PO1 and PSO1. As the problems involves the first principle of engineering and mathematics, It is mapped to PO2 . The concepts of static equilibrium form the basis for design of systems and so mapped to PO3

2	CO2 deals with finding the centroid of areas and CG of volumes, so it is mapped to PO1 and PSO1 as it uses engineering knowledge and mathematical principles. As the problems involves the first principle of engineering and mathematics, It is mapped to PO2 . The concepts of centroid and CG forms the basis for design of mechanical systems and so mapped to PO3.
3	CO3 deals with applying principle of kinematics and kinetics to particles that uses mathematical knowledge to solve complex problems, so it is mapped to PO1 and PSO1. As the problems involves the first principle of engineering and mathematics, It is mapped to PO2 .Only Kinematic parameters and forces are calculated in simple systems and so mapped to PO3 at level1
4	CO4 deals with finding the stresses in rigid bars when forces are applied, so it is mapped to PO1 and PSO1 as it uses engineering knowledge and mathematical principles. As the problems involves the first principle of engineering and mathematics, It is mapped to PO2 . As we study the elementary stresses which forms the basis for design of mechanical systems and so is mapped to PO3.
5	CO5 deals with Torsion of shafts, so it is mapped to PO1 and PSO1 as it uses engineering knowledge and mathematical principles. As the problems involves the first principle of engineering and mathematics, It is mapped to PO2 . As we deal with simple shear stresses which forms the basis for design of mechanical systems mapped to PO3.

SYLLABUS

UNIT I **[10 Periods]**

Statics:

Fundamentals of Mechanics: Basic Concepts, Force Systems and Equilibrium, Moment and Couple, law of Transmissibility, Varignon's theorem, Resultant of force system – problems on Coplanar Concurrent force system , Condition for static equilibrium of coplanar force system, concept of free body diagram.

Friction: Laws of dry friction, limiting friction, angle of friction, Friction problems related to connecting bodies and ladder.

UNIT II **[10 Periods]**

Centroid & Center of Gravity

Centroid: Centroid of Plane figures, first moment of Area and Composite Sections

Center of Gravity: Center of Gravity of Pyramid, hemisphere, Cone and Cylinder.

UNIT III **[10 Periods]**

Dynamics:

Kinematics: Introduction to kinematics-rectilinear motion, uniform velocity, uniform acceleration and variable acceleration. Projectile motion.

Kinetics: Newton's laws of motion, Equation of motion, Work-energy principle and Impulse-momentum principle.

UNIT IV **[10 Periods]**

Simple Stresses and Strains: Stresses and Strains, stress-strain curve of ductile and brittle materials, thermal stresses, Bars of uniform and varying cross-section, Poisson's ratio, volumetric strain and relation between Elastic constants.

UNIT V **[10 Periods]**

Torsion of Shafts: Torsion equation for shaft, shear in solid and hollow shaft, comparison of solid and hollow shafts, polar modulus and power transmitted by shaft.

TEXT BOOKS:

1. Engineering mechanics by Bhavikatti. New age international
2. R.K. Bansal "A Text Book of Strength of Materials, Lakshmi Publications Pvt. Ltd. New Delhi
3. Engineering mechanics by A.K. Tayal.
4. S. Ramamrutham& R, Narayanan, Strength of Materials, Dhanpat Rai publications.

REFERENCE BOOKS:

1. Engineering Mechanics by S. Timoshenko and D.H. Young McGraw-Hill.
2. Mechanics of Materials by E P Popov
3. Dr Sadhu Singh, Strength of Materials
4. Strength of materials by ss rattan 3rd edition

WEB RESOURCES:

1. Engineering Mechanics: https://nptel.ac.in/courses/112/106/112106286/
2. Strength of Materials: https://nptel.ac.in/co105105108/urses/105/105/

Applied Python Programming (Common to CSE, EEE)	
Course Code: 23CS3202	**Credits :02**
Instruction **:** 1 Lecture, 2 Practical /Week	Sessional Marks : 100
End Exam : 3 Hours	

Course Objective:

1. Demonstrate a solid understanding of Python's fundamental syntax, data structures, and control flow constructs.
2. Explore various types of mutable and immutable data types
3. Explore different types of exceptions and how to raise custom exceptions when necessary.
4. Demonstrate the ability to apply OOP principles to create modular, reusable, and maintainable code

Course Outcomes

After course completion, the students will be able to:

1	Apply the features of Python language in various real world applications
2	Apply iterative statements to solve complex problems
3	Implement appropriate core data structure of Python for solving a problem
4	Apply modularity to programs and apply file handling mechanism to solve distinct applications
5	Design object-oriented programs using Python for solving real-world problems

CO-PO –PSO Mapping

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	3					3				1	1
CO2	3	3	3	3	2				3				1	1
CO3	3	3	3	3	3	2	2	2	3	2	2	2	1	1
CO4	3	3	3	3	3	2	2	2	3	2	2	2	1	1
CO5	3	3	3	3	3	2	2	2	3	2	2	3	1	1

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SYLLABUS

Unit - I: **10 Periods**

Introduction to Python Programming: Introduction and Syntax of Python Program: Variables, Keywords, Constants, Installing IDE and Editor, Python Operators and Control Flow Statements

Coding Exercises 01:

1a. Identify the given Variables, Keywords and constants in Python
lb. Use indentation, comments in the given program.
1c. Install the given Python IDE and editor.
1d. Develop the python program to display the given text.
1e.Write simple Python program for the given arithmetic expressions.

1f. Use different types of operators for writing the the arithmetic expressions.
1g. Write a 'Python' program using decision making structure for two-way branching to solve the given problem.
1h. Write a 'Python' program using decision making structure for multi-way branching to solve the given problem.

Unit - II: **10 Periods**

Data Structures: Lists, Tuples, Sets and Dictionaries
Functions, Modules and Packages: Python Built-in Functions, User-Defined Functions: Function definition, Function calling, function arguments and parameter passing, Return statement, Scope of Variables: Global variable and Local Variable.
2a. Write Python program to use and manipulate lists for the given problem
2b. Write python program to use and manipulate Tuples for the given problem
2c. Write python program to use and manipulate Sets for the given problem
2d. Write python program to use and manipulate Dictionaries for the given problem

Unit - III: **10 Periods**

Modules: Writing modules, importing modules, importing objects from modules, Python built — in modules (e.g. Numeric and mathematical module, Functional Programming Module) Namespace and Scoping.
Python Packages: Introduction, Writing Python packages, Using standard (e.g. math, scipy, Numpy, matplotlib, pandas etc.) and user defined packages.
3a. Use the Python standard functions for the given problem.
3b. Develop relevant user defined functions for the given problem using Python code.
3c. Write Python module for the given problem
3d. Write Python package for the given problem

Unit - IV: **10 Periods**
Object-Oriented Programming: Class, Objects and Inheritance: Defining Classes, The Self parameter and Adding Methods to a Class, Display Class Attributes and Methods, Special Class Attributes, Accessibility, The __init Method (Constructor), Passing an Object as Parameter to a Method, del () (Destructor Method), Class Membership Tests, Method Overloading, Operator Overloading, Inheritance, The Object Class.
4a Create classes and objects to solve the given problem.
4b Write Python code for data hiding for the given problem.
4c Write Python code using data abstraction for the given problem
4d. Write Python code using Inheritance for the given problem.

Unit - V: **10 Periods**
I/O Handling: I/O Operations: Reading keyboard input, Printing to screen.
File Handling: Opening file in different modes, accessing file contents using standard library functions, Reading and writing files, closing a file, Renaming and deleting files, Directories in Python, File and directory related standard functions.

Exception Handling: Introduction, Exception handling - 'try: except' Statement, 'raise' statement, User-defined exceptions.
5a. Write Python code for the given reading values from keyboard
5b Read data from the given file.
5c Write the given data to a file.
5d Write Python code to handle the given exceptions through Python program.

TEXT BOOKS

1. Programming and problem solving with Python by Ashok Namdev Kamthane, Amit Ashok Kamthane (2018): McGraw Hill Education (India) Private Limited.
2. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
3. Python 3 for Absolute Beginners, Tim Hall and J-P Stacey, Apress.

REFERENCES

1. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019.
2. Python Pocket Reference 5ed: Python in Your Pocket, Mark Lutz, 2014.

COMMUNICATIVE ENGLISH LAB

Course Code: 23EN2201 **Credits:**1.5
Instruction : 3 periods Sessional Marks:50
End Exam : 3 Hours End Exam Marks:50

Prerequisites: Basic English Grammar

Course Objectives:

1. To give idea about phonetics, linguistics and LSRW skills
2. To develop conversational skills among the students
3. To introduce different accents of English language through presentations
4. To train the students to do various exercises on vocabulary and grammar

Course Outcomes:

By the end of the course, students will be able to

1.	Understand various linguistic, phonetic and communicative aspects	L2
2.	Apply general conversational activities in different socio-cultural contexts with logical thinking.	L3
3.	Analyze cultural diversity of several nations' languages through presentations.	L4
4.	Appraise and reframe various exercises for getting better employability	L4

CO-PO –PSO Mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1									2	2		2			
CO2									2	2		2			
CO3									2	2		2			
CO4									2	2		2			

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes:

CO-PO-PSO Justification	
1	CO1 is mapped with the POs 9, 10, 12. Students can understand various accents of English language and they learn and practice individually and in groups
2	CO2 is suitable to the POs 9, 10, 12 as it makes the students converse, understand and participate in various activities like JAM, Debate, Role-Play etc. Students perform singly and team-wise.

3	CO3 is mapped with the POs 9, 10, 12. Students understand cultural diversity and give effective individual and team presentations.
4	CO4 deals with POs 9, 10, 12 as students write and practice various exercises by using contemporary vocabulary.

SYLLABUS

UNIT I **[12 Periods]**

Introduction to Phonetics – IPA – RP – Phonetic Transcription – Word stress or accent

UNIT II **[9 Periods]**

Functional English – JAM – Debate – Situational Dialogues or Role Plays

UNIT III **[12 Periods]**

Presentations on various topics from academic contexts and on international issues

UNIT IV **[9 Periods]**

Discussing specific topics and practising exercises and short structural talks

REFERENCE BOOKS:

1. Everyday dialogues in English----- Robert J. Dixon.
2. Speak well----- orient black swan.
3. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd
4. Edition, 2018.
5. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
6. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012

e- Resources & other digital material Grammar/Listening/Writing

1. 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ Listening https://learningenglish.voanews.com/z/3613; http://www.englishmedialab.com/listening.html Speaking https://www.talkenglish.com/BBC;
2. Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises All Skills https://www.englishclub.com/;
3. http://www.world-english.org/ http://learnenglish.britishcouncil.org/
4. Online Dictionaries Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

ENGINEERING CHEMISTRY LAB

(EEE, ECE, Mech, Chemical)

Course Code: 23CY1201 **Credits**: 1.5
Instruction: 3 periods per week Sessional marks: 50
End exam: 3 hours End exam marks: 50
Prerequisites: Chemistry at +1 and +2 level

Course Objectives:

1. To impart students with practical knowledge and hands-on experience in analytical chemistry and its engineering applications.
2. To enhance students' proficiency in utilizing instrumental analysis techniques for industrial and environmental applications.

By the end of the course, students will be able to

CO	Statement
1	Apply volumetric analysis and titration principles to prepare standard solutions, standardize acids with strong bases, and assess water quality, food, and soil samples.
2	Proficiently employ diverse analytical methods (spectrophotometric, pH metric, conductometric, and potentiometric) to estimate chemical properties of substances and accurately interpret data results.
3	Cultivate problem-solving and critical thinking skills through practical application of analytical methods and instrumentation in engineering design and decision-making.

CO-PO Mapping

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

Correlation levels: 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)

List of Experiments

1. Preparation of Standard solutions and Standardisation of acid by using Strong base.
2. Determination of Hardness, pH, TDS in ground water sample.
3. Estimation of Zinc in food samplesby Complexometric method.
4. Analysis of Cement sample for Lime content to test the quality.
5. Estimation of available chlorine content in potable water using Iodometric method.
6. Estimation of Iron in an iron ore using potassium thiocyanate by Spectrophotometric method.
7. Determination of Strength of an acid in Lead acid battery by pHmetric method
8. Estimate the strength of acids in an acid mixtureby using Conductometric method.
9. Estimation of Chromium in Dichromate by using Potentiometric method.
10. Determination of Viscosity of various liquid fuels using Ostwald'sViscometer.

Demonstration Experiments

11. Determination of Dissolved Oxygen in a water sample using Iodometric method.
12. Synthesis of Bakelite a thermosetting polymer.
13. Determination of rate constant of ester hydrolysis.

Prescribed Text books:

1. Vogel's text book of Quantitative analysis, 5^{th} edition, G. H. Jeffery, J. Bassett, J. Mendham, R. S. Denney.
2. 2.Vogel's A text book of Macro and semi micro Inorganic analysis, revised by G. Svehla

UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

(Common for All Branches except CE, CSE-AIML, DS)

Course Code: 23MC0101 **Credits:** 0

L	**T**	**P**
2	**0**	**0**

Sessional Marks: 50

End Exam: 3 Hours

Prerequisites: None.

Course objectives:

The objective of the course is to enable the student in

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

Course outcomes:

By the end of the course, students are expected to

1. Articulate Basic human aspirations and requirements for their fulfilment and identify the Role and process of Value education
2. Articulate the needs and activities of the self and body and frame program for self-regulation and health for harmony of the self and body
3. Recognize the value of Relationship and the nine feelings in Relationship for fulfilment of relationship for harmony in the family
4. Identify human goals and articulate systems for their fulfilment leading to harmony in the society; Also identify the characteristics of four orders of nature and mutually fulfilling interaction for harmony in nature.
5. Identify the nature of existence and the role of human being for harmony in existence; Also articulate ethical human conduct, humanistic constitution and holistic Criteria for Technologies, production systems and management models for Universal human order.

Mapping of course outcomes with program outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**						2	2	3				2	2	2	2
	2								3				2			
	3								3				2			
	4						2	3	3	2			2	2	2	2
	5							2	3				2	2		2

SYLLABUS

UNIT – I **[12 Periods]**

Introduction – Fulfillment of Basic Human Aspirations: Need for value education – Process of Value Education – Self-Exploration – Its content and process – Natural Acceptance and Experiential Validation – Basic Human Aspirations – Basic requirements for fulfillment of aspirations – Right understanding, Relationship and Physical Facility- Priority – Human Consciousness – Role of Education-Sanskar – Understanding Happiness and Prosperity – Programme for perpetual happiness and prosperity.

UNIT – II **[12 Periods]**

Harmony in the Self: Human being as co-existence of Self and Body - Needs of Self and Body – Distinguishing Self and Body –Imaginations and its sources – Self-organized /Enslaved behavior - Harmony of the Self and body – Programme for self-regulation and health – Prosperity – Identification of physical facilities.

UNIT – III **[12 Periods]**

Harmony in the Family: Human relationship – Feelings in Relationship – Trust – Intention and competence – Respect as right evaluation– Other feelings in Relationship – Love.

Harmony in the Society: Human Goals – Systems for fulfillment of human goals - Education-Sanskar - Health-Self regulation - Production-Work - Justice-Preservation - Exchange-Storage - Undivided Society, Universal Human Order.

UNIT – IV **[10 Periods]**

Harmony in the Nature: Four Orders of Nature – Characteristics of the four orders – Mutually fulfilling interaction - Understanding the harmony in the Nature

Harmony in the Existence: Existence as Units in Space – Submergence of Units in Space – Existence as Co-existence - Development in the Existential Sense – Role of Human being in Existence

UNIT – V **[10 Periods]**

Universal Human Values and Ethical Human Conduct: Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Humanistic Constitution and Humanistic Universal Order - Holistic Criteria for Technologies, production systems and management models - Holistic Community Model - Journey towards Universal Human Order.

TEXT BOOKS

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2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)