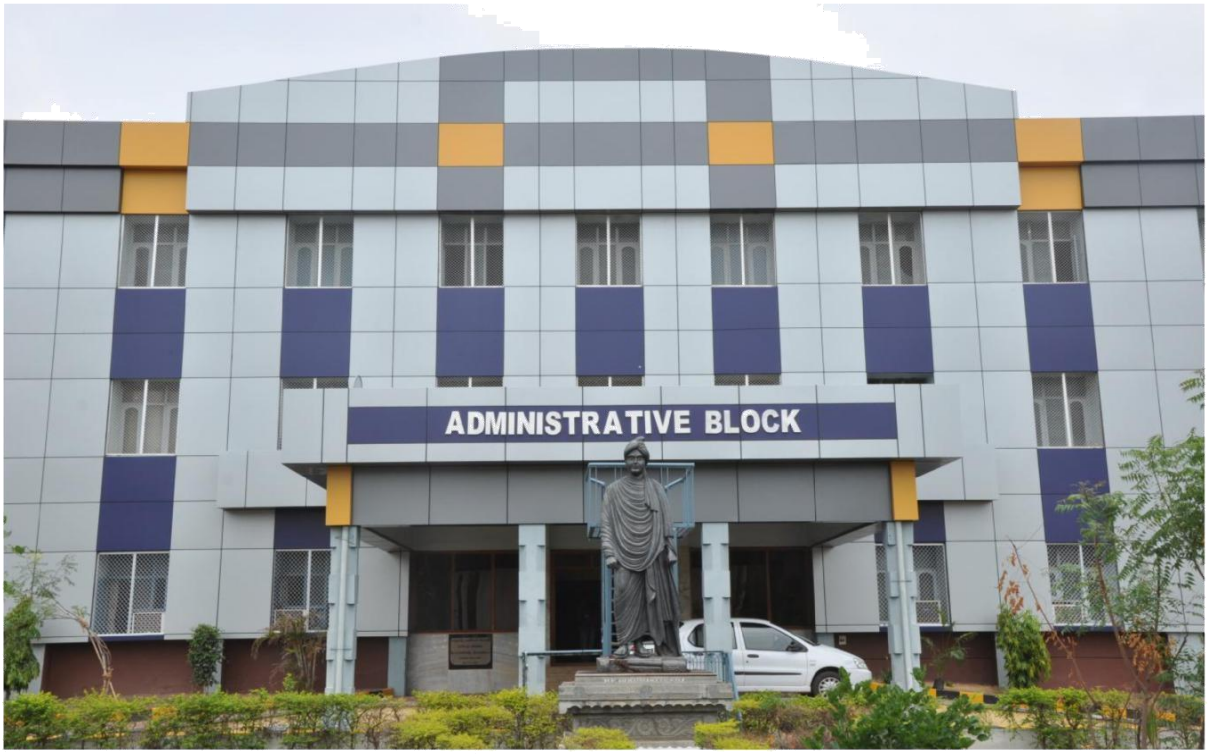

Scheme – 2023

Electrical & Electronics Engineering Department

G. Pulla Reddy Engineering College (Autonomous): Kurnool

Accredited by NBA of AICTE and NAAC of UGC

Affiliated to JNTUA, Anantapuramu

Scheme and Syllabus for

III & IV Year of FOUR YEAR B.Tech. Degree Course in

ELECTRICAL & ELECTRONICS ENGINEERING

(With Effect from the Batch Admitted from 2023-24)

G. PULLA REDDY ENGINEERING COLLEGE (Autonomous): KURNOOL

Accredited by NBA of AICTE & NAAC of UGC

Affiliated to Jawaharlal Nehru Technological University Anantapur, Ananthapuramu

Department of Electrical & Electronics Engineering

Four Year B.Tech. Degree Course

Scheme of Instruction and Examination

V Semester **Scheme-2023**

S.No	Category	Course Code	Title	L	T	P	C	CIA	End Exam Marks	Total Marks
1	PC	EE301	Power Electronics	3	0	0	3	30	70	100
2	PC	EC306	Digital Circuits	3	0	0	3	30	70	100
3	PC	EE302	Power Systems-II	3	0	0	3	30	70	100
4	ES	ESCM03	Introduction to Quantum Technologies And Applications	3	0	0	3	30	70	100
5	PE		Professional Elective- I	3	0	0	3	30	70	100
6	OE		Open Elective-I	3	0	0	3	30	70	100
7	PC	EE306	Power Electronics Lab	0	0	3	1.5	30	70	100
8	PC	EC307	Analog and Digital Circuits Lab	0	0	3	1.5	30	70	100
9	SC	SCEE01	Skill Enhancement course	0	1	2	2	30	70	100
10	ES	ESCM02	Tinkering Lab	0	0	2	1	30	70	100
11			Evaluation of Community Service Internship	-	-	-	2	100	-	100
			Total	**18**	**1**	**10**	**26**			

VI Semester **Scheme-2023**

S. No.	Category	Course Code	Title	L	T	P	C	CIA	End Exam Marks	Total Marks
1	PC	EE307	Electrical Measurements and Instrumentation	3	0	0	3	30	70	100
2	PC	EE308	Microcontrollers and Applications	3	0	0	3	30	70	100
3	PC	EE309	Power System Analysis	3	0	0	3	30	70	100
4	PE		Professional Elective-II	3	0	0	3	30	70	100
5	PE		Professional Elective-III	3	0	0	3	30	70	100
6	OE		Open Elective - II	3	0	0	3	30	70	100
7	PC	EE315	Electrical Measurements and Instrumentation Lab	0	0	3	1.5	30	70	100
8	PC	EE316	Microcontrollers Lab	0	0	3	1.5	30	70	100
9	SC	SCEE02	Skill Enhancement course	0	1	2	2	30	70	100
10	AC		Audit Course	2	0	0	-	-	-	-
Total				**20**	**1**	**8**	**23**			
Mandatory Industry Internship of 08 weeks duration during summer vacation										

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Department of Electrical & Electronics Engineering

Four Year B.Tech. Degree Course

Scheme of Instruction and Examination

VII Semester **Scheme-2023**

S.No.	Category	Course Code	Title	L	T	P	C	CIA	End Exam Marks	Total Marks
1	PC	EE401	Power System Operation and Control	3	0	0	3	30	70	100
2	BS&H		Management Course- II Elective	2	0	0	2	30	70	100
3	PE		Professional Elective-IV	3	0	0	3	30	70	100
4	PE		Professional Elective-V.	3	0	0	3	30	70	100
5	OE		Open Elective - III	3	0	0	3	30	70	100
6	OE		Open Elective-IV	3	0	0	3	30	70	100
7	SC	SCEE03	Skill Enhancement course	0	0	4	2	30	70	100
8	AC		Audit Course	2	0	0	-	-	-	-
9			Internship Evaluation of Industry Internship	-	-	-	2	100	-	100
Total				**19**	**0**	**4**	**21**			

VIII Semester **Scheme-2023**

S.No.	Category	Title	L	T	P	C	Total Marks
1	PR	Internship and Project	-	-	24	12	100

V Semester **Professional Elective- I** **Scheme-2023**

S.No.	Category	Course Code	Title
1	PE	EE303	Signals and Systems
2	PE	EE304	Electrical safety and Risk Management
3	PE	EE305	Modern Control Theory

VI Semester **Professional Elective- II** **Scheme-2023**

S.No.	Category	Course Code	Title
1	PE	EE310	AI&ML for Electrical Engineering
2	PE	EE311	Programmable Logic Controllers
3	PE	EE312	Switchgear and Protection

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Department of Electrical & Electronics Engineering

Four Year B.Tech. Degree Course

Scheme of Instruction and Examination

VI Semester **Professional Elective- III** **Scheme-2023**

S.No.	Category	Course Code	Title
1	PE	EC322	Communication systems
2	PE	EE313	Electric Drives
3	PE	EE314	Renewable and Distributed Energy Technologies

VII Semester **Professional Elective- IV** **Scheme-2023**

S.No.	Category	Course Code	Title
1	PE	EE402	Elements of Digital Signal Processing
2	PE	EE403	Electric Vehicle Technology
3	PE	EE404	HVDC & FACTS

VII Semester **Professional Elective- V** **Scheme-2023**

S.No.	Category	Course Code	Title
1	PE	EE405	Utilization of Electrical Energy
2	PE	EE406	Switched Mode Power Conversion
3	PE	EE407	Electrical Distribution System

Skill Enhancement course **Scheme-2023**

S.No.	Category	Course Code	Title
1	SC	SCEE01	Introduction to Python Programming
2	SC	SCEE02	Applications of Soft Computing Tools in Electrical Engineering
3	SC	SCEE03	Power Systems and Simulation Lab

Audit Course **Scheme-2023**

S.No.	Category	Course Code	Title
1	AC	AC201	Environmental Science
2	AC	AC301	Technical Paper Writing & IPR
3	AC	AC401	Gender Sensitization
4	AC	AC402	Constitution of India

Management Course-II Elective **Scheme-2023**

S.No.	Category	Course Code	Title
1	BSH	HSM401	Business Ethics and Corporate Governance
2	BSH	HSM402	E-Business
3	BSH	HSM403	Management Science

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Department of Electrical & Electronics Engineering

Four Year B.Tech. Degree Course

Scheme of Instruction and Examination

V Semester **Open Elective-I** **Scheme 2023**

S. No.	Course Code	Title	Offering Department	Eligible Branches
1	OE501	Green Buildings	CE	All Branches
2	OE502	Construction Technology and Management	CE	All Branches Except CE
3	OE503	Electrical Safety Practices and Standards	EEE	All Branches Except EEE
4	OE504	Sustainable Energy Technologies	ME	All Branches Except ME
5	OE505	Electronic Circuits	ECE	All Branches Except ECE
6	OE506	Java Programming	CSE	CE, EEE, ME and ECE
7	OE507	Foundations of Artificial Intelligence	CSE	CE, EEE and ECE
8	OE508	Ethical Hacking	CSE	All Branches
9	OE509	Mathematics for Machine Learning and AI	CSE	All Branches
10	OE510	Materials Characterization Techniques	HBS	All Branches
11	OE511	Chemistry of Energy Systems		
12	OE512	English for Competitive Examinations		
13	OE513	Entrepreneurship and New Venture Creation		

VI Semester **Open Elective-II** **Scheme 2023**

S. No.	Course Code	Title	Offering Department	Eligible Branches
1	OE601	Disaster Management	CE	All Branches
2	OE602	Sustainability In Engineering Practices	CE	All Branches Except CE
3	OE603	Renewable Energy Sources	EEE	All Branches Except EEE
4	OE604	Automation and Robotics	ME	All Branches Except ME
5	OE605	Product Lifecycle Management	ME	All Branches Except ECE
6	OE606	Digital Electronics	ECE	CE, EEE, ME and ECE
7	OE607	Foundations of Operating Systems	CSE	CE, EEE and ECE
8	OE608	Foundations of Machine Learning	CSE	All Branches
9	OE609	Web Technologies		
10	OE610	Introduction to Information Systems		
11	OE611	Optimization Techniques	HBS	All Branches

12	OE612	Physics of Electronic Materials And Devices		
13	OE613	Chemistry of Polymers And Applications		
14	OE614	Academic Writing and Public Speaking		
15	OE615	Mathematical Foundation of Quantum Technologies		

VII Semester **Open Elective-III** **Scheme 2023**

S. No.	Course Code	Title	Offering Department	Eligible Branches
1	OE701	Building Materials and Services	CE	All Branches Except CE
2	OE702	Environmental Impact Assessment	CE	All Branches
3	OE703	Smart Grid Technologies	EEE	All Branches Except EEE
4	OE704	3D Printing Technologies	ME	All Branches Except ME
5	OE705	Composite Materials	ME	All Branches
6	OE706	Applications of Microprocessors and Microcontrollers	ECE	All Branches Except EEE and ECE
7	OE707	Introduction to Database Systems	CSE	CE, EEE, ME and ECE
8	OE708	Cyber Security	CSE	CE, EEE, ME and ECE
9	OE709	Modern C++	CSE	All Branches
10	OE710	Wavelet transforms and its Applications	HBS	All Branches
11	OE711	Smart Materials And Devices		
12	OE712	Green Chemistry And Catalysis For Sustainable Environment		
13	OE713	Employability Skills		
14	OE714	Introduction to Quantum Mechanics		

VII Semester **Open Elective-IV** **Scheme 2023**

S. No.	Course Code	Title	Offering Department	Eligible Branches
1	OE715	Geo-Spatial Technologies	CE	All Branches Except CE
2	OE716	Solid Waste Management	CE	All Branches
3	OE717	Electric Vehicles	EEE	All Branches Except EEE
4	OE718	Total Quality Management	ME	All Branches Except ME
5	OE719	Safety in Engineering Industry	ME	All Branches
6	OE720	Transducers and Sensors	ECE	All Branches Except ECE
7	OE721	Drone Technology	ECE	All Branches
8	OE722	Introduction to Computer Networks	CSE	CE, EEE, ME and ECE

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Department of Electrical & Electronics Engineering

Four Year B.Tech. Degree Course

Scheme of Instruction and Examination

9	OE723	Internet of Things	CSE	CE, EEE, ME and ECE
10	OE724	Multimedia & Animation	CSE	All Branches
11	OE725	Advanced Information Systems	CSE	CE, EEE, ME and ECE
12	OE726	Quantum Computing	CSE	All Branches
13	OE727	Financial Mathematics	HBS	All Branches
14	OE728	Sensors and Actuators for Engineering Applications		
15	OE729	Chemistry of Nano materials and Applications		
16	OE730	Literary Vibes		

POWER ELECTRONICS(PE)

V Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE301	Professional core	3	0	0	3	30	70	100

Sessional Exam Duration:2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand the working, characteristics and gate driver requirements of power semi conductor devices like diode, Thyristor, BJT, GTO, TRIAC, MOSFET & IGBT.

CO2: Analyze the principle and operation of single and three phase controlled rectifiers with R and RL loads.

CO3: Analyze the working of single and multi quadrant chopper circuits with R, RL loads

CO4: Analyze the working of AC voltage controller and cyclo-converters with R and RL loads.

CO5: Analyze the working of single and three phase voltage and current source inverters.

UNIT – I

Basics of Power Electronics

Introduction to power electronics, scope and applications, power semiconductor switches (Diodes, Thyristor, TRIAC, BJT, MOSFET, IGBT and GTO) operation and its characteristics, SCR triggering & Commutation methods, Gate drive circuits (Qualitative treatment only).

UNIT – II

AC-DC Converters

Study of single-phase and three-phase half wave and full wave-controlled rectifiers (Full bridge and half Bridge) with R and RL loads (Continuous and Discontinuous modes of operation), Significance of freewheeling diode, Dual converters - circulating and non-circulating current modes. Simple Problems

UNIT – III

DC-DC Converters

Time ratio control and current limit control strategies. Principle and operation of Step-down, Step-up, Step UP/Down choppers, Types of choppers Type- A, B, C, D and E. Simple Problems

UNIT – IV

AC-AC Controllers

AC voltage controller-Integral cycle control, Phase angle control. Single-phase AC voltage controllers with two SCRs in anti-parallel and TRIAC with R and RL loads. Simple Problems.

Cyclo-converters – Single phase midpoint and bridge type cyclo-converters with step-up and step-down modes of operation with R and RL loads.

UNIT – V

DC-AC Converters

Types of Inverters, single-phase voltage source inverters (half bridge and full bridge), Voltage control and harmonic reduction methods in inverters. Single phase current source inverters with ideal switches, Single phase series inverter and parallel inverter – basic principle of operation only. Three-phase voltage source inverters with 180^0 and 120^0 mode of operation. Simple problems.

Text Books:

1. P.S. Bimbhra, "Power Electronics", 4th Edition, Khanna publishers. 2010
2. M.D. Singh and K.B. Khanchandani , "Power Electronics", 2nd Edition, Tata McGraw Hill Publishers. 2002.
3. M.H. Rasheed, "Power Electronics Circuits Devices and Applications", 3rd Edition, PHI publishers. 2004

Reference Books:

1. P.C. Sen, "Power Electronics", 35th Reprint, Tata McGraw Hill Publishers. 2010
2. Ashfaq Ahmed, "Power Electronics for Technology" First Indian Reprint, Pearson Education Publishers. 2003
3. Ned Mohan, ―Power Electronics‖, Wiley, 2011.
4. VedamSubramanyam, ―Power Electronics‖, New Age International (P) Limited, 1996.

Web References:

1. https://nptel.ac.in/courses/1081
2. https://www.youtube.com/watch?v=Coy-WRCfems

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

DIGITAL CIRCUITS (DC)

V Semester: EEE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EC306	Professional core	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand and simplify logical expressions using Boolean algebra &karnaugh map to design minimal logic circuits.

CO2: Apply the principles of digital logic design adders and code converters

CO3: Design various combinational logic circuits.

CO4: Design various sequential logic circuits

CO5: Analyze the functionality of programmable logic devices& digital ICs

UNIT – I

Logic Simplification and Combinational Logic Design

Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR- AND and NAND/NOR realizations.

UNIT – II

Introduction to Combinational Design 1

Binary Adders, Subtract or sand BCD adder, Code converters- Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display

UNIT – III

Combinational Logic Design 2

Decoders, Encoders, Priority Encoder, Multiplexers, De multiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT – IV

Sequential Logic Design

Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT – V

Programmable Logic Devices & Digital IC's

ROM, Programmable Logic Devices (PLA and PAL). Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

Text Books:

1. Digital Design, M.Morris Mano & Michel D.Ciletti, 5th Edition, Pearson Education, 1999.

2. Switching theory and Finite Automata Theory, ZviKohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books:

1. Kumar, Anand. A., Fundamentals of Digital Circuit, 4th Edition, Prentice-Hall India, New Delhi, 2016
2. Fundamentals of Logic Design, Charles H Roth, Jr., 5th Edition, Brooks/coleCengage Learning, 2004.
3. Fletcher, W.L., An Engineering Approach to Digital Design, Pearson India, 2015

Web References:

1. https://nptel.ac.in/courses/117106086/1
2. http://www.nptelvideos.in/2012/12/digital-systems-design.html
3. http://www.nptelvideos.in/2012/12/digital-circuits-and-systems.html

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

POWER SYSTEMS – II (PS-II)

V Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE302	Professional core	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1: Analyze the transmission lines and obtain the transmission line parameters and their constants.

CO2: Analyze the performance of transmission line

CO3: Apply the concepts of sag insulators & corona to over head line transmission line

CO4: Understand the phenomena of power system transients

CO5: Apply compensation techniques for the control of reactive power and voltage.

UNIT – I

Transmission Line Parameters

Types of Conductors - Calculation of Resistance for Solid Conductors, Bundle Conductors, Skin effect, Proximity effect, Concept of GMR & GMD- Transposition of Power lines- Calculation of inductance for single phase and three phase, Single and Double circuit lines, Symmetrical and asymmetrical conductor configurations with and without transposition. Calculation of Capacitance for 2 wire and 3 wire systems, effect of ground on Capacitance, Capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems

UNIT – II

Performance of Transmission Lines

Classification of Transmission Lines-Short, medium and long line and their models representation - Nominal-T, Nominal-π and A, B, C, D Constants for symmetrical networks, Numerical Problems and solutions for estimating regulation and efficiency of all types of lines. Ferranti effect and Charging Current

UNIT – III

Overhead Line Insulators

Types of Insulators, String efficiency and Methods for improvement, – Voltage Distribution, Calculation of String efficiency, Capacitance Grading and Static Shielding., Numerical Problems.

Sag and Tension: Sag and Tension Calculations with equal and unequal heights of towers, wind and ice on weight of conductor, Stringing chart, Sag template and its applications Numerical Problems.

Corona: Corona- factors affecting corona, critical voltages and Power loss due to Corona. Radio Interference

UNIT – IV

Power System Transients

System transients and its types, travelling wave phenomena, attenuation, distortion, reflection and refraction coefficients, termination of lines with different types of conditions - open circuited line, short circuited line and T Junction , numerical problems.

UNIT – V

Voltage Control and Power Factor Improvement: Methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

Reactive Power Control: Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

Text Books:

1. C.L. Wadhwa, ―Electrical Power Systems‖, New Age International Pub. Co, Third Edition, 2001.
2. D.P. Kothari and I.J. Nagrath, ―Modern Power System Analysis‖, Tata McGraw Hill Pub. Co., New Delhi, Fourth edition, 2011.
3. B.R.Gupta,― Power System Analysis and Design‖, S.ChandPublishing.1998.

Reference Books:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, ―A Text book on Power System Engineering‖, DhanpatRai Publishing Company (P) Ltd, 2008.
2. John J. Grainger & W.D. Stevenson, ―Power System Analysis‖, McGraw Hill International,1994.
3. Hadi Sadat, ―Power System Analysis‖, Tata McGraw Hill Pub. Co. 2002.
4. W.D. Stevenson, ―Elements of Power system Analysis‖, McGraw Hill International Student Edition.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ee17/preview

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each

unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS (IQTA)
(Qualitative Treatment)

V Semester: Common for all Branches | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
ESCM03	ES	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Explain core quantum principles in a non-mathematical manner
CO2:	Compare classical and quantum information systems.
CO3:	Identify theoretical issues in building quantum computers.
CO4:	Discuss quantum communication and computing concepts.
CO5:	Recognize applications, industry trends, and career paths in quantum technology

UNIT – I

Introduction to Quantum Theory and Technologies: The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China

UNIT – II

Theoretical Structure of Quantum Information Systems: What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

UNIT – III

Building a Quantum Computer – Theoretical Challenges and Requirements: What is required to build a quantum computer (conceptual overview)?, Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:

Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities

UNIT – IV
Quantum Communication and Computing – Theoretical Perspective: Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential
UNIT – V
Applications, Use Cases, and the Quantum Future: Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race
Text Books:
1. Michael A Nielsen and Isaac L Chuang, Quantum Computation and Quantum Information, Cambridge University Press, Cambridge.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, Cambridge.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, Cambridge.
Reference Books:
1.David McMahon, Quantum Computing Explained, Wiley.
2.Phillip Kaye, Raymond Laflamme and Michele Mosca, An Introduction to Quantum Computing, Oxford University Press.
3.Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press.
4.Alastair I M Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications.
5.Eleanor G Rieffel and Wolfgang H Polak, Quantum Computing: A Gentle Introduction, MIT Press.
6.Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books.
7.Bruce Rosenblum and Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press.
8.Giuliano Benenti, Giulio Casati and Giuliano Strini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing
9.K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission.
10. Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications.
Online Learning Resources:
1. https://www.coursera.org/learn/quantum-mechanics

2. https://nptel.ac.in/courses/106106232

Question Paper Pattern:

Qualitative Treatment

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

POWER ELECTRONICS LAB (PE(P))							
V Semester:EEE					Scheme:2023		
Course Code	Hours/Week			Credits	Maximum Marks		
EE306	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	3	1.5	30	70	100
End Exam Duration:3 Hrs							

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

CO1: Understand I-V characteristics and Gate driver circuits of SCR, MOSFET, IGBT.

CO2: Apply phase angle control for 1-Φ half and fully controlled bridge converters, 1-ϕ dual converter, 1-ϕ cyclo-converter and 1-ϕ, 3-ϕ AC voltage controller to control output power.

CO3: Apply duty ratio control for choppers and inverter to control output power.

List of Experiments

Note: At least 10 of the following experiments shall be conducted

1. Steady state characteristics of SCR, IGBT and MOSFET.
2. R, RC and digital triggering methods for SCR.
3. Single-phase fully controlled bridge converter.
4. Single-phase half controlled bridge converter.
5. Three-phase fully controlled bridge converter.
6. Three-phase half controlled bridge converter.
7. Single phase dual converter
8. Single-phase mid-point cyclo-converter
9. Single-phase AC voltage controller with 2 SCR's
10. Single-phase AC voltage controller with TRIAC.
11. Three-phase AC voltage controller
12. Single phase full bridge PWM inverter
13. Forced commutated step down chopper
14. Step up chopper
15. Step up and step down chopper

ANALOG AND DIGITAL CIRCUITS LAB (ADC (P))							
V Semester:EEE						**Scheme:2023**	
Course Code	**Hours/Week**			**Credits**	**Maximum Marks**		
EC307	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
	0	**0**	**3**	**1.5**	**30**	**70**	**100**
End Exam Duration:3 Hrs							

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

CO1: Interpret the characteristics of diodes and transistors for circuit design.

CO2: Construct and evaluate rectifiers, amplifiers, and oscillator circuits.

CO3: Implement basic Op-Amp applications, combinational and sequential circuits using logic gates.

CO4: Design digital systems using universal gates, multiplexers, and comparators.

CO5: Develop and realize fundamental digital components such as adders, converters, flip-flops, encoders, and decoders.

List of Experiments

Note: Execute minimum 5 experiments from each cycle.

Part-A (ANALOG CIRCUITS)

1. CB Characteristics
2. CE Characteristics
3. CE Amplifier
4. CC Amplifier
5. Clippers
6. Clampers
7. RC Phase shift oscillator
8. Astablemultivibrator
9. A to D Convertor
10. Op-Amp Applications-Adder, subtractor, comparator

Part-B (DIGITAL CIRCUITS)

1. Realization of Boolean Expressions using Gates.
2. Design and realization of logic gates using universal gates.
3. Design a 4 – bit Adder / Subtractor.
4. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter.
5. Design and realization of 8x1 MUX using 2x1 MUX.
6. Design and realization of 4 bit comparator.
7. Design and realization of Flip-Flops.
8. Design and realization of Encoders.
9. Design and realization of Decoders.
10. Design and realization of Comparator.

TINKERING LAB							
V Semester: EEE					**Scheme:2023**		
Course Code	**Hours/Week**			**Credits**	**Maximum Marks**		
ESCM02	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
	0	**0**	**2**	**1**	**30**	**70**	**100**
End Exam Duration:3 Hrs							

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

CO1: Encourage Innovation and Creativity

CO2: Provide Hands-on Learning and Impart Skill Development

CO3: Foster Collaboration and Teamwork

CO4: Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship

CO4: Impart Problem-Solving mind-set

List of Experiments

Note: At least 10 of the following experiments shall be conducted

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Demonstrate a traffic light circuit using breadboard.
3. Build and demonstrate automatic Street Light using LDR.
4. Simulate the Arduino LED blinking activity in Tinkercad
5. Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6. Interfacing IR Sensor and Servo Motor with Arduino.
7. Blink LED using ESP32.
8. LDR Interfacing with ESP32.
9. Control an LED using Mobile App.
10. Design and 3D print a Walking Robot
11. Design and 3D Print a Rocket.
12. Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.
13. Demonstrate all the steps in design thinking to redesign a motor bike

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION (EMI)

VI Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE307	Professional Core	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand principle and working of electrical measuring instruments

CO2: Understand the principle of operation of instrument transformers, energy meters and analog instruments

CO3: Understand the principle and working of various DC and AC bridges for the measurement of Resistance, Inductance and Capacitance

CO4: Understand the principle and working of different digital voltmeters and sensors.

CO5: Understand the working of various transducers and data acquisition systems.

UNIT – I

Measuring Instruments & Digital Meters

Fundamentals: True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold); Error Analysis- Simple problems; Statistical treatment of data-Simple problems.

Indicating Instruments: Three forces in Electromechanical indicating instrument (Deflecting, controlling & damping forces); Moving iron type (attraction and repulsion), PMMC, Electrodynamometer Type instruments: Torque equation (Expression only, no derivation), shape of scale – simple problems on torque equations; Measurement of voltage and current - Extension of Range of ammeter and voltmeter – problems on extension of range of ammeter and voltmeter.

UNIT – II

Measurement of Power, Power Factor and Energy

Instrument transformers: Types, CT and PT – Ratio and phase angle errors; (Expression only, no derivation)

Measurement of power: Principle and Operation of Single-phase dynamometer wattmeter, expression (Expression only no derivation) for deflecting and control torques, errors and compensations.

Measurement of power factor: Principle and operation of Single-phase Electrodynamometer Power factor meter.

Measurement of Frequency: Principle and Operation of single phase frequency meter- vibrating reed type, - ferro dynamic type meter.

Measurement of Energy: Principle and Operation of Single phase induction type energy meter, driving and braking torques (expression only no derivation), errors and compensations, testing by

phantom loading.

UNIT – III

D.C & A.C Bridges

Measurement of Resistance: Methods of measuring low, medium and high resistances – Sensitivity of Whetstone's bridge– Kelvin's double bridge for Measuring low resistance, Megger for measurement of high resistance.

Measurement of Inductance: - Maxwell's bridge, Anderson's bridge.

Measurement of Capacitance: De Sauty bridge. Wien's bridge–Schering bridge–Numerical problems.

UNIT – IV

Digital Volt Meters and Sensors

Digital Voltmeters: Ramp type, Dual Slope integrating type, successive approximation, Potentiometric type DVMs.

Silicon based micro sensors: Pressure sensor, Gyro sensor, Accelerometer, Flow sensor, Proximity sensor, Temperature sensor, Humidity sensor. (Elementary treatment only)

UNIT – V

Transducers and Data Acquisition

Definition of Transducers, Classification of Transducers, Active/passive, analog/digital- Strain Gauge-gauge factor (Elementary treatment only)-applications of strain gauge, Q-Meter, Advantages of Electrical Transducers, Principle Operation of Resistor, Inductor and Capacitive Transducers; LVDT and its Applications, Thermistors, Thermocouples, Piezo Electric Transducers, Photo electric Transducers, Hall effect, Photo Diodes.

Introduction to PLC and SCADA Systems: Data acquisition systems (DAS) and interfacing techniques

Text Books:

1. Electrical & Electronic Measurement & Instruments by A.K. SawhneyDhanpatRai& Co. Publications, 2007.
2. Electrical Measurements and measuring Instruments–by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011
3. Buckingham and Price, "Electrical Measurements", Prentice – Hall

Reference Books:

1. Electronic Instrumentation by H.S.Kalsi,TataMcgrawhill,3rd Edition,2011
2. Electrical Measurements: Fundamentals, Concepts, Applications–by Reissl and, M.U, New Age International (P) Limited, 2010.
3. Electrical & Electronic Measurement & Instrumentation by R.K. Rajput, 2nd Edition, S. Chand & Co., 2nd Edition, 2013.
4. Sensor Technology: Hand Book by Jon S. Wilson, ELSEVIER publications,2005

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ee112/preview

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

MICROCONTROLLERS AND APPLICATIONS (MCA)

VI Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE308	Professional core	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1: Understand the architecture, operation, and configurations of 8086 microprocessors.

CO2: Understand the architectural features and I/O Functions of Microcontroller 8051.

CO3: Understand the architectural features and I/O Functions of MSP430

CO4: Understand architectural features, various instructions, I/O Functions and serial peripherals of Arduino.

CO5: Understand the pin configuration of Node MCU, ESP32 and architectural features of Raspberry PI.

UNIT – I

Introduction to Microprocessor

Internal architecture,pin diagram/description, 8086 microprocessor family, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.Simple programs on arithmetic and logical operations.

UNIT – II

8051 Microcontroller

8051 Microcontroller Architecture, Input / Output ports and circuits, External memory, counters and Timers, Serial data input/output, interrupts.

UNIT – III

MSP430 Microcontroller

MSP430 CPU Architecture, System Buses, Memory Organization - I/O Subsystem Organization - General Features, Low-power Philosophy- Oscillators and Clocks, Pin layout of MSP430 and Configuring of GPIO Ports.

UNIT – IV

Arduino UNO Microcontroller

Board Description - Pin layout of arduino UNO micro controller – Architecture of Arduino Micro-controller. Interfacing of IR sensor to Arduino UNO microcontroller.

NodeMCU controller

Board Description - Pin layout of NodeMCU Development Board. Interfacing of Ultrasonic sensor to NodeMCU microcontroller.

UNIT – V

ESP32 controller

Board Description - Pin layout of ESP32 Development Board. Interfacing of Temperature and Humidity sensor to ESP32 microcontroller.

Raspberry PIcontroller

Board Description - Pin layout of Raspberrry PI Development Board.- Architecture - setting and configuring the board - General purpose IO pins.

Text Books:

1. Kenneth J. Ayala, "The 8051 Microcontroller", Penram International Publication Ltd, 2006.
2. John H Davies, "MSP430 Microcontroller Basics", Newnes Publications, Elsevier, 2008
3. Simon Monk , " Programming Arduino: Getting Started with Sketches", McGraw Hill, 2nd Edition,
4. Simon Monk, " Programming the Raspberry Pi: Getting Started with Python", McGraw-Hill Education, Edition:2, 2015.
5. Jeff Cicolani, "Beginning Robotics with Raspberry Pi and Arduino: Using Python and OpenCV", Apress, 1st ed, 2018,
6. Vijay Madisetti, ArshdeepBahga, "Internet of Things: A Hands-On Approach", Orient Blackswan Private Limited - New Delhi; First edition

Reference Books :

1. Chris Nagy, Embedded Systems Design using TI MSP430 Series, Newnes Publications, Elsevier, 2003.
2. Blum Richard, "Arduino Programming in 24 Hours", Sams Publishers, 1st Edition.

Web References:

1. https://onlinecourses.nptel.ac.in/noc18_ec03/
2. http://www.nptel.onlinecourseac.in/microprocessorsandmicrocontrollers
3. https://www.ti.com/
4. https://www.arduino.cc/

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

POWER SYSTEM ANALYSIS (PSA)								
VI Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE309	**Professional Core**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration:2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand the concepts of per unit values, Y_{Bus} and Z_{Bus} formation.

CO2: Apply the Z_{Bus} formation technique for addition of branch and addition of removal of link.

CO3: Apply the iterative technique for load flow analysis.

CO4: Analyze symmetrical and unsymmetrical short circuits

CO5: Apply the concepts of power system stability.

UNIT – I

PER-UNIT System and Y-bus Formation

Per-Unit representation of Power system elements - Per-Unit equivalent reactance network of a three phase Power System - Graph Theory: Definitions, Bus Incidence Matrix, Y-Bus formation by Direct and Singular Transformation Methods, Numerical Problems.

UNIT – II

Formation of Z- bus

Formation of Z-Bus: Partial network, Algorithm for the Modification of Z-Bus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses - Modification of Z-Bus for the changes in network

UNIT – III

Power Flow Analysis

Static load flow equations – Load flow solutions using Gauss Seidel Method: Algorithm and Flowchart. Acceleration Factor, Load flow Solution for Simple Power Systems (Max. 3-Buses): Newton Raphson Method in Polar Co-Ordinates Form: Load Flow Solution- Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods

UNIT – IV

Short Circuit Studies

Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Symmetrical Component Theory: Positive, Negative and Zero sequence components, Positive,

Negative and Zero sequence Networks. Symmetrical Fault Analysis: LLLG faults with and without fault impedance, Unsymmetrical Fault Analysis: LG, LL and LLG faults with and without fault impedance, Numerical Problems.

UNIT – V

Stability Analysis

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Derivation of Swing Equation, Power Angle Curve and Determination of Steady State Stability. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Numerical methods for solution of swing equation - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers

Text Books:

1. Computer Methods in Power System Analysis by G.W. Stagg and A.H. El-Abiad, McGraw-Hill, 2006.
2. Modern Power system Analysis by I.J. Nagrath& D.P. Kothari, Tata McGraw-Hill Publishing Company, 4th Edition, 2011.

Reference Books:

1. Power System Analysis by Grainger and Stevenson, McGraw Hill, 1994.
2. Power System Analysis by HadiSaadat, McGraw Hill, 1998.
3. Power System Analysis and Design by B.R. Gupta, S. Chand & Company, 2005.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ee120/preview

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB (EMI (P))							
VISemester:EEE							**Scheme:2023**
Course Code	**Hours/Week**			**Credits**	**Maximum Marks**		
EE315	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
	0	**0**	**3**	**1.5**	**30**	**70**	**100**
							End Exam Duration:3 Hrs

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

CO1: Determine the unknown Resistance, Inductance and Capacitance using AC and DC bridges

CO2: Understand the calibration of single phase energy meter.

CO3: Understand the measurement of power, power factor in a single phase circuit, real, reactive Power in a three phase circuit and Extend the range of Ammeter and Voltmeter.

CO4: Understand the working of Transducers, Measure distance, temperature, current, voltage and humidity using sensors.

List of Experiments

Note: At least 10 of the following experiments shall be conducted

1. Measurement of resistance using Wheatstone bridge and Kelvin‘s Double Bridge.
2. Measurement of inductance using Maxwell‘s bridge, Anderson bridge.
3. Measurement of capacitance using De-Sauty's bridge, Schering bridge.
4. Calibration of single phase energy meter using direct loading method.
5. Calibration of energy meter using Phantom load kit.
6. Measurement of Power using 3-Voltmeter and 3-Ammeter methods in a single phase Circuit.
7. Measurement to Real and Reactive Power in a three phase circuit.
8. Extension of range of given Ammeter and Voltmeter.
9. Measurement of displacement using LVDT.
10. Study of CRO: Measurement of voltage, current, frequency using lissajous patterns.
11. Measurement of voltage of a given battery and current through divide circuit using Arduino.
12. Measurement of temperature and humidity using Arduino.
13. Measurement of distance of the object using Arduino
14. Measurement of different ranges of temperatures using i) RTD ii) Thermocouple
15. Measurement of strain with the help of strain gauge transducers

MICROCONTROLLERS LAB(MC(P))							
VISemester:EEE					**Scheme:2023**		
Course Code	**Hours/Week**			**Credits**	**Maximum Marks**		
EE316	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
	0	**0**	**3**	**1.5**	**30**	**70**	**100**
						End Exam Duration:3 Hrs	

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

CO1: Write programs for different applications for the 8086 Microprocessor and controllers

CO2: Understand the configuration of sensors with MSP 430.

CO3: Understand interfacing of sensors with Arduino, NodeMCU, ESP32, and Raspberry PI.

List of Experiments

Note: At least 10 of the following experiments shall be conducted

1. Programs for 16 Bit Arithmetic Operations (Using various addressing modes)
   a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.
   b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.
   c) Write an ALP to find square, cube and factorial of a given number.
2. Programs using Arithmetic and Logical Instructions for 8051
   a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,
   b) Multiplication and Division.
   c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR
   d) Programs related to Register Banks
3. a. Configure the GPIO ports of MSP430 to blink RED LED with a delay.
   b. Configure the GPIO ports of MSP430 to blink GREEN LED with a delay.
   c. Configure the GPIO ports of MSP430 to blink GREEN and RED LEDs, together and alternately.
4. a. Configure the GPIO ports of MSP430 to turn the RED LED ON when the push button is pressed and turn RED LED OFF when it is released.
   b. Configure the GPIO ports of MSP430 to turn the GREEN LED ON when the push button is pressed and turn GREEN LED OFF when it is released.
   c. Configure the GPIO ports of MSP430 to turn the RED LED ON When the push button is pressed and turn GREEN LED ON when the button is released.
5. Display the output of temperature and humidity sensor on serial monitor using Arduino.
6. Display the output of Ultrasonic sensor on serial monitor using Arduino.
7. a) Turn on an array of LEDs one by one, from left to right and then from right to left using Arduino.
   b) Blinking of array of LED's equivalent to hexadecimal number ranging from 00 to FF using

Arduino.
8. Display the output of temperature and humidity sensor on serial monitor using NodeMCU.
9. Display the output of Ultrasonic sensor on serial monitor using NodeMCU.
10. Interfacing IR sensor with NodeMCU and display the sensor output on serial monitor
11. Display the output of temperature and humidity sensor on serial monitor using ESP32.
12. Display the output of Ultrasonic sensor on serial monitor using ESP32.
13. To interface IR sensor with Raspberry PI and display the sensor output on serial monitor.
14. Display the output of temperature and humidity sensor using Raspberry PI.
15. Display the output of Ultrasonic sensor using Raspberry PI.

POWER SYSTEM OPERATION AND CONTROL (PSOC)								
VII Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE401	**Professional Core**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration:2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand the Thermal Station Characteristics and Economic Dispatch Problem of Thermal Units

CO2: Understand the Optimal Scheduling of Hydro-Thermal Station with minimization of cost of Thermal station.

CO3: Develop the First Order Models of Turbine, Governor and Generator Load and Evaluate the Steady State & Dynamic Analysis of Single Area and Two Area Load Frequency Control

CO4: Understand the Aspects of Power System Deregulation.

CO5: Understand the concepts of Smart Grids.

UNIT – I

Optimum Operation of Thermal Power Station:

Heat Rate Curve – Cost Curve – Incremental Fuel Rate – Incremental Fuel Cost and Production Cost, Input – Output Characteristics of Thermal Power Stations and Hydro Power Stations. Optimum Generation Allocation of Thermal Units without Transmission Line Losses and Optimum Generation Allocation with effect of Transmission Line Losses. Transmission Line Loss Formula, Loss coefficients, Numerical Problems

UNIT – II

Economic Operation of Hydro – Thermal Scheduling

Hydrothermal Coordination Methods – Optimal power flow problem formulation for loss and cost minimization, Solution of optimal power flow problem using Newton‘s method and Linear Programming technique – Numerical problems.

UNIT – III

Load Frequency Control

Modeling of Turbine & Governor: The first order Turbine model, Block Diagram representation of Steam Turbines and approximate Linear models, Mathematical Modeling of Speed Governing Systems – Derivation of small Signal Transfer function – Block Diagram

Single Area Load Frequency Control: Necessity of Keeping Frequency constant, Definition of Control Area – Single Area Control – Block Diagram representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Controlled & Uncontrolled case.

Two Area Load Frequency Control: Load Frequency control of Two Area system – Controlled and Uncontrolled case, Tie – Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

UNIT – IV

Power System Deregulation

Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems.

UNIT – V

Introduction to Smart Grid Solutions

Advanced Metering Infrastructure, Demand Response, Distributed generation. Home Area Network, Communication, Cyber Security, Electric Vehicles, Electric Energy Storages (EES).

Text Books:

1. Modern Power System Analysis, D.P. Kothari and I.J. Nagrath, Tata McGraw Hill Publishing Company Ltd.,
2. Electric Energy Systems Theory: An Introduction, Olle I. Elgerd, TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.

Reference Books:

1. Power Generation, Operation and Control, Allen J. Wood and Bruce F. Wollenberg, John Wiley & Sons, Inc., New York, 2nd edition, 1996.
2. Reactive Power Control in Electric Systems, T J E Miller, John Wiley & Sons, New York, 1982.
3. Power System Analysis Operation and Control, AbhijitChakrabarti and SunitaHalder, PHI Learning Pvt. Ltd.,, 3rd Edition, 2010.

Web References:

1. https://archive.nptel.ac.in/courses/108/104/108104052/
2. http://kcl.digimat.in/nptel/courses/video/108104191/L01.html
3. https://nptel.ac.in/courses/108101040

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each

unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

SIGNAL AND SYSTEMS (S&S)

V Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE303	Professional Elective -I	3	0	0	3	30	70	100

Sessional Exam Duration:2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand the basic operations and classify various signals and systems.

CO2: Develop Various Fourier series forms of represent periodic signals.

CO3: Apply Fourier transform to continuous and discrete time signals.

CO4: Apply Laplace transform to continuous time signals.

CO5: Apply Z- transform to discrete time signals.

UNIT – I

Signals and Systems

Definition of signal-Representation of Continuous and Discrete Time Signals , Elementary Signals-Unit Impulse, Unit Step Functions, Unit Ramp Signal, Triangular Function, Signum Function, Exponential Signal Function and Sinusoidal Signal Function, Basic operations on Signals, Classification of Signals-Deterministic and Random Signals, Periodic and Non-Periodic Signals, Energy and Power Signals, Causal and Non-Causal Signal-Numerical Problems, Definition of System-Classification of Continuous and Discrete Time systems-Static and Dynamic System, Causal and Non-Causal Systems, Linear and Non-Linear Systems, Time-invarient and Time varying systems, Stable and Unstable systems, LTI Systems -Numerical Problems

UNIT – II

Fourier series representation of periodic signals

Introduction,Fourier Series Representation of Continuous Time Periodic Signals, Existence of the Fourier Series, Trigonometric Form of Fourier Series, Polar Form of Fourier Series, Exponential Form of Fourier Series –Numerical Problems.

UNIT – III

Fourier Transform

Introduction, Continuous Time Fourier Transform, Existence of Fourier Transform, Properties of the Continuous Time Fourier Transform, Fourier Transform of common signals, Fourier Transform of a periodic signal,Inverse Fourier Transform, Discrete-time Fourier Transform ,Existence of Discrete-time Fourier Transform, Inverse Discrete-time Fourier Transform, Sampling Theorem (Elementary Treatment only).

UNIT – IV

Laplace Transforms

Review of Laplace Transform, comparison of Laplace transform and Fourier transform, Region of Convergence, Properties of the Laplace Transform, Laplace Transform of periodic signals,Inverse Laplace Transform.

UNIT – V

Z – Transforms

Introduction to Z-Transform, Relation between Z-transform and Discrete Time Fourier transform, Region of Convergence for the Z-Transform, Properties of the Z-Transform, Z-Transforms of some common signals, Inverse Z-Transform- Long division method, Partial fraction expansion method, Residue method.

Text Books:

1. AlanV.Oppenheim,AlanS.Willsky,&S.Hamid,"SignalsandSystems",2nd Edition, Pearson Higher Education, 1997.
2. B.P.Lathi , "PrinciplesofLinearSystemsandSignals",2nd Edition, Oxford University Press

Reference Books:

1. Simon Haykin and B. VanVeen, "Signals &Systems", 2nd Edition, John Wiley, 2003.
2. Narayana Iyerand K SatyaPrasad , "Signals and systems", 1st Cengagelearning,2011.
3. C.L. Philips J.M.Parrand Eve A. Riskin , "Signals, Systems and Transforms", 4th Edition, Pearson education, 2008.
4. A. Anand Kumar, "Signals and Systems" ,PHI publications,2012

Web References:

1. https://ocw.mit.edu/courses/6-011-introduction-to-communication-control-andsignal-processing-spring-2010/a6bddaee5966f6e73450e6fe79ab0566_MIT6_011S10_notes.pdf
2. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
3. https://lecturenotes.in/subject/36/signals-and-systems-ss.

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ELECTRICAL SAFETY AND RISK MANAGEMENT (ESRM)

V Semester: EEE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE304	Professional Elective -I	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand the role of Electrical Safety, Shocks and their Prevention.

CO2: Understand the Safety aspects during Installation of Plant and Equipment.

CO3: Understand electrical safety in residential, commercial and agricultural installations.

CO4: Understand the purpose of electrical safety in hazardous areas and importance of earthing.

CO5: Understand the electrical systems safety management and IE rules.

UNIT – I

Introduction to Electrical Safety, Shocks and Their Prevention

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over‘s, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

UNIT – II

Safety During Installation of Plant and Equipment

Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

UNIT – III

Electrical Safety in Residential, Commercial and Agricultural Installations

Wiring and fitting – Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do‘s and Don‘ts for safety in the use of domestic electrical appliances.

UNIT – IV

Electrical Safety in Hazardous Areas Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations – Classification of equipment enclosure for various hazardous gases and

vapours – classification of equipment/enclosure for hazardous locations.

Equipment Earthing and System Neutral Earthing: Introduction, Distinction between system grounding and Equipment Grounding, Equipment earthing, Functional Requirement of earthing system, description of a earthing system, , neutral grounding (System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

UNIT – V

Safety Management of Electrical Systems: Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees.

Review of IE Rules and Acts and Their Significance: Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage –Rules regarding first aid and fire fighting facility. The Electricity Act, 2003, (Part1, 2, 3,4 & 5)

Text Books:

1. S. Rao, Prof. H.L. Saluja, "Electrical safety, fire safety Engineering and safety management",Khanna Publishers. New Delhi, 1988.
2. SteliLoznen, ConstantinBolintineanu ,"Electrical Product Compliance and Safety Engineering", Artech House Publishers , 2021.
3. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, "Electrical Safety Handbook," McGraw-Hill Education, 4th Edition, 2012.
4. Charles D. Reese, "Occupational Health and Safety Management: A Practical Approach," CRC Press, Taylor & Francis Group, 3rd Edition, 2015.

Reference Books:

1. PradeepChaturvedi,*"Energymanagementpolicy,planningandutilization",*Concept Publishing company, New Delhi, 1997.
2. Geoffrey Bottrill, Derek Cheyne, G. Vijayaraghavan, "Practical Electrical Equipment and Installations in Hazardous Areas," Newnes (Elsevier), Oxford, 2005.
3. Martha J. Boss, Gayle Nicoll, "Electrical Safety: Systems, Sustainability, and Stewardship," CRC Press, Taylor & Francis Group, 2019.

Web References:

1. www.apeasternpower.com/downloads/elecact2003.pdf.
2. https://www.scribd.com/document/824732926/NFPA-70E-2024-Standard-for-Electrical-Safety-in-the-Workplace-NFPA-Z-Library.
3. https://cercind.gov.in/Act-with-amendment.pdf.

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain

Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

MODERN CONTROL THEORY (MCTH)

V Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE305	Professional Elective -I	3	0	0	3	30	70	100

Sessional Exam Duration:2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand the concept of controllability and observability.

CO2: Understand the concept of state space analysis.

CO3: Understand the concept of Nonlinear systems.

CO4: Understand the concept of stability.

CO5: Understand the concept of optimal control methods.

UNIT – I

Controllability and Observability

Concepts of controllability and observability, Controllability tests for continuous time, discrete time, time invariant systems, observability tests for continuous time and discrete time, time invariant systems, controllability and observability modes in state.

UNIT – II

State Space Analysis and Design of Control Systems

Jordon's canonical form, controllable and observable companion forms for single input single output systems. Pole placement by state feedback. State observer.

UNIT – III

Nonlinear systems

Behavior of non-linear systems, Jump resonance, sub-harmonic oscillation, limit cycles, common physical non linearities, singular points, phase plane method. Construction of phase plane trajectories, isocline method, delta method, computation of time.

UNIT – IV

Stability

Liapunov's stability criteria, Theorems. The direct method of Liapunov for linear systems. Methods of constructing Liapunov, function Krasovski"s method, variable gradient method.

UNIT – V

Optimal Control

Formulation of optimal control problem, calculus of variations, Minimisation of functional, formulation of variational calculus using Hamiltonian method.

Text Books:

1. "Control systems engineering", by I.J.Nagrath and M.Gopal, New age International

publishers.
2. "Modern control system theory", by M.Gopal, TMH publishers.
3. "Advanced Control Theory", by A.NagoorKani, 2nd Edition, RBA Publication.
4. "Discrete Time Control Systems", by Ogata. K, 2nd Edition, Pearson Publication.
Reference Books:
1. "Modern control systems", by Richard. C. Dorfand. R. H. Bishop Addison Wesley longman.
2. "State functions and linear control systems", by Schultz and Melsa
3. "Control system Engineering", by NISE, Wiley, 2000.
Web References:
1. https://www.pearson.com/store/p/modern-control-engineering/P100000726706
2. https://ocw.mit.edu/courses/6-241j-dynamic-systems-and-control-spring-2011/
3. https://nptel.ac.in/courses/108/102/108102043/
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions. **End Examination:** The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

AI & ML FOR ELECTRICAL ENGINEERING(AIMLEE)								
VI Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE310	**Professional Elective -II**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration:2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understanding the basics and architecture of Artificial Intelligence

CO2: Understanding and apply concepts of Machine Learning

CO3: Implementing ANN Applications in Real-World Problems

CO4: Understanding and Applying Fuzzy Logic Concepts

CO5: Analyzing and Applying AI techniques in Electrical Engineering

UNIT – I

Introduction to Artificial Intelligence

Introduction and motivation - Approaches to AI - Architectures of AI - Symbolic Reasoning System - Rule based Systems - Knowledge Representation - Expert Systems.

UNIT – II

Overview of Machine Learning

The Motivation & Applications of Machine Learning: Learning Associations, Classification, Regression; Supervised Learning; Unsupervised Learning; Reinforcement Learning; Gradient Descent: Batch Gradient Descent, Stochastic Gradient Descent; Data pre processing; Under fitting and Over fitting issues.

UNIT – III

Artificial Neural Networks

Basics of ANN - Comparison between Artificial and Biological Neural Networks - Basic Building Blocks of ANN - Artificial Neural Network Terminologies - McCulloch Pitts Neuron Model - Learning Rules - ADALINE and MADALINE Models - Perceptron Networks (Continuous and Discrete) – Perceptron Convergence Theorem - Back Propagation Neural Networks.

UNIT – IV

Fuzzy Logic

Classical Sets - Fuzzy Sets - Fuzzy Properties, Operations and relations - Fuzzy Logic System - Fuzzification - Defuzzification - Membership Functions - Fuzzy Rule base - Fuzzy Logic Controller Design.

UNIT – V

Applications of AI Techniques

Load forecasting, Load flow studies, Economic load dispatch, Speed control of DC Motor, Speed Control of Induction Motors.

Text Books:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Neural Networks using MATLAB", McGraw Hill Edition, 2006.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Third Edition, WILEY India Edition, 2012.
3. EthemAlpaydin, “Introduction to Machine Learning”, MIT Press, 3rd edition, 2014
4. Russell. S and Norvig. P, “Artificial Intelligence - A Modern Approach”, 4th edition, Pearson, 2022

Reference Books:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer International Edition, 2013.
2. Yung C. Shin and ChengyingXu, "Intelligent System - Modeling, Optimization & Control, CRC Press, 2009.
3. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012

Web References:

1. https://online.egr.msu.edu/articles/ai-machine-learning-electrical-computer-engineering-applications/
2. https://www.youtube.com/watch?v=zu6VKOtl0PY
3. https://www.youtube.com/playlist?list=PLDkq31epwdjxiZ0DSk46oNsgejkeS8XRN

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

PROGRAMMABLE LOGIC CONTROLLERS (PLC)								
VI Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE311	**Professional Elective -II**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration:2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand different types of PLCs, Its classification and the usage of Easy Veepsoftware

CO2: Analyze the hardware details of Allen Bradley PLC

CO3: Design PLC Programming for various applications

CO4: Apply PLC programming concepts in different fields of Science and Technology

CO5: Develop Instruction using ADD and SUB functions, UP and Down counters

UNIT – I

Introduction to PLCs

Basic functions of PLCs, Mechanical relays versus PLC, Different types of PLC‘s – Allen-Bradley – Micrologix: ML1000, ML1100, SLC500, Compact Logix, Mitsubishi FX series, HMI‘s, Processor and I/O cards.

UNIT – II

PLC Computational Tool

Introduction to Easy Veep software, Link between mechanical, electrical and programming documentation, Logic diagrams, Flip-Flop Logic, M8000, M8001 internal bits interpretation, Binary code, data table, manipulation and search engine in Mitsubishi environment Communication between PC and PLC, Communication between PC and HMI, PLC and HMI Serial Local network, Introduction to SLC500.

UNIT – III

PLC Development

PLC software and applications, Boolean algebra – understanding binary code, ADD and SUB functions, UP and Down Counters, Introduction to k1Y0, MOV function, CPR and ZCP functions, SHWT and SHRD instructions, Introduction to Absolutely Drum Instruction. Allen Bradley PLC: Introduction to Rockwell Software, Hardware focus, Hardware considerations (Field wiring, Master Control Relay, VFD), Basic programming and applications, Cascade control – subroutine, Different programs.

UNIT – IV

PLC Programming

Programming instructions: Instructions and binary interpretation, Bit Instruction, Timers and counters, Comparison instructions, Programming Instructions - Math instructions, Move and

Logical Instructions, Discussions of programming, communications for PLC-Robotic arm, Exercise of setup and monitoring

UNIT – V

Applications

Analog and Digital parameters by using SLC5/03-VFD-Panel Mate series 1700, Practical Troubleshooting, troubleshooting technique, Control system stability and tuning basics. Applications: Process to rewind, test, and integrate with extrusion process for wiring and fibre optic industries, Food industry – yeast, flour distribution and control. Process Medical equipment Industry – Gas analyzer, Leak tester (using CO2), plastic wrapping machines etc.

Text Books:

1. Hugh Jack "Automating manufacturing systems with PLCs" Lulu.com -2010
2. Siemens "PLC Hand Book" Automationdirect.com- 2020

Reference Books:

1. R. Bliesener, F Ebel, Festo "Programmable Logic Controllers" Didactic publishers.2002.
2. W. Bolton "Programmable Logic Controllers" Newnes,4th Edition,- 2006
3. Jay F. Hooper "Introduction to PLCs" Carolina Academic Press, 2nd Edition, 2006

Web References:

1. https://electrical4u.com/programmable
2. https://nptel.ac.in/courses/108105088
3. https://watelectrical.com/industrial-applications-of-programmable-logic-controller/

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

SWITCHGEAR AND PROTECTION (SGP)

VI Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE312	Professional Elective-II	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand the operation of different circuit breakers and their specifications.

CO2: Analyze the concepts of different relays which are used in real time power system operation.

CO3: Apply various protective schemes for Transformers, Rotating machines.

CO4: Explain different protective schemes used for Bus bars and Feeders.

CO5: Understand the methods of protection against over voltages and importance of neutral grounding.

UNIT – I

Circuit Breakers

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages - Restriking Phenomenon, Average, Max. RRRV, Current Chopping and Resistance Switching - CB ratings and Specifications, Selection of CB: Types and Numerical Problems. – Auto-reclosures. Description and Operation of- Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT – II

Electromagnetic, Static and Numerical Relays

Basic Requirements of Relays – Primary and Backup protection - Construction details of – Attracted armature, balanced beam, inductor type and differential relays – Universal Torque equation – Characteristics of over current, Direction and distance relays. Static Relays – Advantages and Disadvantages – Definite time, Inverse and IDMT static relays – Comparators – Amplitude and Phase comparators. Microprocessor based relays – Advantages and Disadvantages – Block diagram for over current (Definite, Inverse and IDMT), Distance Relays, Impedance Relays and Reactance Relays with their Flow Charts.

UNIT – III

Protection of Generators and Transformers

Protection of generators: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on percentage winding unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholtz relay Protection.

UNIT – IV

Protection of Feeders, Transmission Lines and Bus bars

Protection of Feeders (Radial & Ring main) using over current Relays. Protection of Transmission lines – 3 Zone protection using Distance Relays. Carrier current protection. Protection of Bus bars -Differential protection, Differential Pilot wire protection.

UNIT – V

Protection Against Over Voltages

Generation of Over Voltages in Power Systems. -Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL. Neutral Grounding, Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance – Arcing Grounds and Grounding Practices.

Text Books:

1. Switchgear and Protection – by Sunil S Rao, Khanna Publishers.
2. Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, TMH Publications.

Reference Books:

1. Protective Relaying Principles and Applications – J Lewis Blackburn, CRC Press.
2. Numerical Protective Relays, Final Report 2004 – 1009704 EPRI, USA.
3. Protective Relaying Theory and Applications - Walter A Elmore, Marcel Dekker.
4. Transmission network Protection by Y.G. Paithankar, Taylor and Francis, 2009.
5. Power System Protection- P. M. Anderson, Wiley Publishers.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ee101/preview

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsoryshort answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

COMMUNICATION SYSTEMS (CS)

VI Semester: EEE — **Scheme:2023**

CourseCode	Category	Hours/Week			Credits	MaximumMarks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EC322	Professional Elective-III	3	0	0	3	30	70	100

SessionalExamDuration:2 Hrs — **EndExamDuration:3 Hrs**

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

CO1: Analyze amplitude modulation and demodulation techniques.

CO2: Analyze modulation and demodulation techniques for angle modulation..

CO3: Understand the principles of various pulse modulation and multiple access Techniques.

CO4: Analyze various digital modulation techniques.

CO5: Understand the basic concepts of wireless communication systems.

UNIT– I

Analog communication-I

Elements of communication systems, need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation (AM), Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier (DSB SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband (SSB) transmission, VSB Modulation.

UNIT– II

Analog communication-II

Angle Modulation & Demodulation: Concept of instantaneous frequency Generalized concept of angle modulation, Bandwidth of angle modulated waves- Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Pre-emphasis & De-emphasis, Illustrative Problems.

UNIT– III

Digital Communications-I

Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation.(Qualitative Approach only)

Multiple Access Techniques

Introduction to multiple access techniques, FDMA, TDMA, CDMA, SDMA: Advantages and applications

UNIT– IV

Digital communications-II

Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M-PSK techniques.(Qualitative Approach only)

UNIT– V

Wireless communications

Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3G cellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile (GSM), GSM services and features.(Qualitative Approach only)

TextBooks

1. SimonHaykin,"CommunicationSystems", 2nd Edition, WileyEastern, 2008
2. K.SamShanmugam,"DigitalandAnalogCommunicationSystems",2nd Edition,Wiley- India,2008
3. T.S.Rappaport,"WirelessCommunications",2ndEdition, PrenticeHallofIndia, 2012.

ReferenceBooks

1. Kennedy.G.,"ElectronicCommunicationSystems",5th edition.Mc-GrawHill, 2014.
2. Taub,HandD.Schilling, "PrinciplesofCommunicationSystems", 3rd edition, TataMcGraw Hill, 2013.
3. A.BruceCarlson,"CommunicationSystems",5th edition,McGraw HillInternational, 2012.
4. SimonHaykin,"DigitalCommunication",2nd Edition,WileyEastern,2006.

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsoryshort answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ELECTRIC DRIVES (ED)

VI Semester: EEE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE313	Professional Elective -III	3	0	0	3	30	70	100
Sessional Exam Duration:2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Analyze the operational aspects of various DC-DC converters fed DC Drives operating in different modes.

CO2: Analyze the operational aspects of various AC-DC converters fed DC Drives operating in different modes.

CO3: Analyze the principle and operation of converters for AC machines.

CO4: Understand operational aspects of various AC-AC converters for induction motor drives.

CO5: Understand operational aspects of various synchronous motors, BLDC motors and steppers motors with converters.

UNIT – I

Introduction To Electric Drives and Chopper Fed DC Drives

Electrical drives — block diagram, advantages of electric drive, parts of electric drives, choice of electrical drives, the status of DC and AC drives. Electric braking methods - regenerative, dynamic and plugging.

DC-DC converters with RLE load. Control of DC separately excited motor by one,two and four quadrant choppers - voltage and current waveforms for continuous conduction (motoring, regenerative and dynamic braking), speed-torque expressions and characteristics.

UNIT – II

Single-Phase and Three Phase Converter Fed DC Drives

Study of single-phase and three-phase full wave-controlled rectifiers (Full Bridge and half Bridge) with RLE loads. Performance analysis of single-phase rectifiers under continuous mode of operation.Control of DC separately excited motor by single-phase and three-phase half and full bridged converters - voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics.Multi-quadrant operation of DC separately excited DC motor fed dual converter and field current reversal.Closed loop control of separately excited DC motor (Block diagram only).

UNIT – III

Converters for AC Machines

Operation of three phase AC voltage controller. Operation of three to single phase and three phase to three phase cyclo-converter. PWM techniques-single pulse modulation, multiple pulse modulation, sinusoidal pulse modulation for single phase VSI, Harmonic Analysis of output parameters. Sinusoidal pulse width modulation technique for three phase VSI. Single phase and three phase auto sequential current source inverters.

UNIT – IV

Induction Motor Drives

Review of operation of induction motor, Torque-speed characteristic. Variable voltage control, variable frequency constant voltage and v/f control of induction motor, speed torque characteristics. Voltage Source Inverters (VSIs) and Current Source Inverters (CSIs) fed induction motor and closed loop operation of induction motor drives (Block diagram only). Comparison of VSI and CSI fed drives. Static rotor resistance control, slip power recovery schemes–Static Scherbius drive, Static Kramer drive, speed torque characteristics.

UNIT – V

Synchronous and special motor Drives

Review of operation of synchronous motor, Torque-speed characteristic. Operation of self and separate -controlled synchronous motor Drives. Load commutated CSI fed Synchronous motor—operation and speed torque characteristics. BLDC motor operation and control, Stepper Motor control drives (Variable reluctance and permanent magnet).

Text Books:

1. M.H. Rasheed, "Power Electronics Circuits Devices and Applications", 3rd Edition, PHI publishers. 2004
2. G.K. Dubey, "Fundamentals of Electrical drives" 2 nd Edition, Narosa Publishers. 2001
3. P.S. Bimbhra, "Power Electronics", 4th Edition, Khanna publishers. 2010

Reference Books:

1. G.K. Dubey, "Power Semiconductor controlled drives", Prentice-Hall, Englewood Cliffs, Publishers. 1989.
2. VedamSubrahmanayam, "Electrical drives concepts and applications", Tata McGraw Hill publishers.2008.
3. M. D. Singh, K. B. Khanchandani (2008), Power Electronics, 2nd Edition, Tata McGraw Hill Publications, New Delhi.
4. .S. K. Pillai (2007), A First course on Electrical Drives, 2nd Edition, New Age International (P) Ltd.,NewDelhi

Web References:

1. https://nptel.ac.in/courses/108101126/
2. https://web.iitd.ac.in/~amitjain/Drives_VTR.pdf

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES (RDET)

VI Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE314	Professional Elective -III	3	0	0	3	30	70	100

Sessional Exam Duration:2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand the energy scenario and importance of solar energy.

CO2: Understand the generation and classification of wind and Bio-mass energy.

CO3: Understand the importance of energy storage, fuel cells and green energy.

CO4: Understand the distributed generation and grid integration.

CO5: Understand the economic and control aspects of Distributed Generation.

UNIT – I

Energy Scenario and Solar Energy

Introduction: Fundamentals of renewable energy sources, Types of energy, Renewable and Non-renewable energy, SWOT analysis, Global warming and climate change, World energy transformation by 2050, Prospects of renewable energy in the world, Renewable energy availability in India.

Solar Energy Fundamentals: Solar Spectrum, propagation of solar radiation from the sun to earth; solar radiation geometry: sun-earth geometry, extra-terrestrial and terrestrial radiation. Solar Thermal: Solar Collectors, Solar parabolic trough, Solar tower, Solar cooker, Solar water heater, Solar dryer, Solar Pond.

Solar Electric Power Generation: A Generic PV Cell, PV Materials, Equivalent Circuits for PV Cells, Modules and Arrays; I-V Curve under Standard Testing Conditions; Impact of Temperature and Insolation on I-V curves; Shading Impacts on I-V curves; Maximum Power Point Trackers (MPPT).

UNIT – II

Wind and Other Energy Systems

Wind Energy: Air, Wind, Global and Local Wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Classification of wind energy conversion system (WECS)- Horizontal axis- single, double and multiblade system. Vertical axisSavonius and darrieus types

Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft). Tidal Power: fundamental characteristics of tidal power, harnessing tidal energy, advantages, and limitations.

UNIT – III

Energy Storage and Green Energy

Energy Storage: Stationary Battery Storage – Basics of Lead-Acid batteries, Battery Storage Capacity, Coulomb efficiency instead of energy efficiency, Battery Sizing. Different Battery storage technologies and comparison of their performance. Introduction to Super capacitors. Green Energy: Historical Development, Basic Operation of a Fuel Cell, Fuel Cell Thermodynamics, Entropy and the theoretical efficiency of Fuel Cells, Gibbs Free Energy and Fuel Cell efficiency, Electrical output of an Ideal Cell, Electrical Characteristics of Real Fuel Cells, Types of Fuel Cells, H2: Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy

UNIT – IV

Introduction to DG and its Grid Integration

Introduction: Need for Distributed generation, renewable sources in distributed generation, current scenario in Distributed Generation, Planning of DGs – Siting and sizing of DGs – optimal placement of DG sources in distribution systems.

Grid integration of DGs: Different types of interfaces - Inverter based DGs and rotating machine-based interfaces - Aggregation of multiple DG units. Energy storage elements: Batteries, ultra-capacitors, flywheels.

UNIT – V

Technical Impact, Economic and Control aspects of DG

Technical impacts of DGs: Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems Economic and control aspects of DGs: Market facts, issues, and challenges - Limitations of DGs. Voltage control techniques, Reactive power control, Harmonics, Power quality issues. Reliability of DG based systems – Steady-state and Dynamic analysis.

Text Books:

1. Muhammad Kamran, Muhammad RayyanFazal, "Renewable Energy Conversion Systems", First Edition, Elsevier Academic Press, 2021. 2. G. D. Rai, Non
2. G. D. Rai, Non-Conventional Sources of Energy, Khanna Publisher, 2004

Reference Books:

1. G N Tiwari, Solar Energy: Fundamentals, Design, Modeling and Applications, Narosa, 2002.
2. Mukund R Patel, Wind and Solar Power Systems: Design, Analysis, and Operation, 2nd Edition, Taylor & Francis, 2006.
3. H. Lee Willis, Walter G. Scott, ―Distributed Power Generation – Planning and Evaluation‖, Marcel Decker Press, 2000.
4. Gilbert M. Masters, ―Renewable and Efficient Electric Power Systems‖, 2nd Edn., IEEE Press, Wiley, 2013.
5. N. Jenkins, J.B. Ekanayake and G. Strbac, ―Distributed Generation‖, 1st Edn, The Institution of Engineering and Technology, London, 2010.

Web References:

1. https://archive.nptel.ac.in/courses/121/106/121106014/#

2. https://onlinecourses.nptel.ac.in/noc22_ch27/preview
3. https://www.nptelvideos.com/lecture.php?id=8517

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ELEMENTS OF DIGITAL SIGNAL PROCESSING (EDSP)

VII Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE402	Professional Elective - IV	3	0	0	3	30	70	100

Sessional Exam Duration:2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand the properties of discrete time signals, systems and z-transform.

CO2: Apply Discrete Fourier Transform and Fast Fourier Transform techniques to digital signals.

CO3: Understand the designing and realization of IIR filters.

CO4: Understand the designing and realization of FIR filters

CO5: Understand the architectures of Programmable DSP Devices.

UNIT – I

Introduction to discrete time signals and systems

Introduction to digital signal processing, Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems.

Z–Transform

Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems, analysis of linear time-invariant systems in the z-domain, pole-zero stability.

UNIT – II

Discrete Fourier Transform

Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT.

Fast Fourier Transform

Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT – III

IIR Filters

Introduction to digital filters, Analog filter approximation – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations. Basic structures of IIR Filters - Direct form-I, Direct form-II, Cascade form and Parallel form realizations.

UNIT – IV

FIR Filters

Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase

FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR &FIR filters, Basic structures of FIR Filters– Direct form, Cascade form, Linear phase realizations.

UNIT – V

Architectures for Programmable DSP Devices

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flagsin the status registers, On-chip memory, On-chip peripherals.

Text Books:

1. John G. Proakis, Dimitris G. Manolaki, "Digital Signal Processing, Principles, Algorithms, and Applications", Pearson Education, PHI, 2007
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", PHI, 2009
3. B. Venkataramani, M. Bhaskar , "Digital Signal Processors – Architecture, Programming and
4. Applications", TATA McGraw Hill. 2002.
5. 4.Loney Ludeman, "Fundamentals of Digital Signal Processing"– JohnWiley,2009

Reference Books:

1. S.K. Mitra, Digital Signal Processing – A practical approach, 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling, Sandra L. Harris, "Fundamentals of Digital Signal Processing using Matlab", Thomson. 2007.
4. A. Anand Kumar "Digital signal processing", PHI, 2007.

Web References:

1. https://nptel.ac.in/courses/nptel_download.php?subjectid=117102060
2. https://lecturenotes.in/subject/44/digital-signal-processing-dsp
3. https://www.dspguide.com/ch28/1.htm
4. https://onlinecourses.nptel.ac.in/noc22_ee99/preview,
5. https://nptel.ac.in/courses/108105055

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ELECTRIC VEHICLE TECHNOLOGY (EVT)								
VII Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE403	**Professional Elective-IV**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration:2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand the history of EV's and its importance.

CO2: Understand various drive topologies and its power flow control.

CO3: Understand various electrical drives suitable for EV's.

CO4: Understand different types of energy storage devices.

CO5: Understand various energy management strategies and thermal protection of batteries.

UNIT – I

Introduction To Electric Vehicles

History of electric vehicles, social and environmental importance of electric vehicles, impact of modern drive-trains on energy supplies.

Case Study

Comparison by efficiency of Conventional, Hybrid, Electric and Fuel cell Vehicles.

UNIT – II

Electric Drive-Trains

Basic concept of electric traction, Introduction to various electric drive-train topologies, Power flow control in electric drive-train topologies.

UNIT – III

Electric Drives & Control

Introduction to electric components used in electric vehicles, Control of BLDC Motor, Control of Induction Motor Drive, Permanent Magnet (PM) motor Drive & Switched Reluctance Motor (SRM) Drive.

UNIT – IV

Energy Storage

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its modeling, SOC, Different Types of Batteries, Super Capacitor based energy storage and its analysis, Fuel Cells, Hybridization of different energy storage devices.

UNIT – V

Energy Management Strategies & Charging Infrastructure

Introduction to energy management strategies used in electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies, Types of EV charging Infrastructure

&Standardized Communication protocols for EV charging.

Case Studies

Current issues in electric Vehicles, Thermal Protection of Battery.

Text Books:

1. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, ―Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2nd Edition, 2017. (Unit-I, II)
2. Ali Emadi, ―Advanced Electric Drive Vehicles (Energy, Power Electronics, and Machines)‖, CRC Press, 2015. (Unit-III)
3. John G. Hayes and A. Goodarzi, ―Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles‖, Wiley, 2018. (Unit-IV & V)

Reference Books:

1. James Larminie, John Lowry, ―Electric Vehicle Technology Explained‖, Wiley, 2 nd Edition 2012.

Web References:

1. https://nptel.ac.in/courses/108106170
2. https://onlinecourses.nptel.ac.in/noc22_ee53
3. https://onlinecourses.nptel.ac.in/noc21_ee112

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

HVDC AND FACTS (HVDCFACTS)

VII Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE404	Professional Elective -IV	3	0	0	3	30	70	100

Sessional Exam Duration:2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand various conventional control mechanisms, transmission networks.

CO2: Understand the necessity of HVDC systems as emerging transmission networks.

CO3: Understand the necessity of reactive power compensation devices.

CO4: Design equivalent circuits of various HVDC system configurations.

CO5: Design and analysis of various FACTS devices.

UNIT – I

Introduction

Electrical Transmission Networks, Conventional Control Mechanisms-Automatic Generation Control, Excitation Control, Transformer Tap-Changer Control, Phase-Shifting Transformers; Advances in Power-Electronic Switching Devices, Principles and Applications of Semiconductor Switches; Limitations of Conventional Transmission Systems, Emerging Transmission Networks, HVDC and FACTS. Concepts of virtual inertia.

UNIT – II

High Voltage Dc Transmission – I

Types of HVDC links – Mono polar, Homo polar, Bipolar and Back-to-Back, Advantages and disadvantages of HVDC Transmission, Analysis of Graetz circuit, Analysis of bridge circuit without overlap, Analysis of bridge with overlap less than 600, Rectifier and inverter characteristics, complete characteristics of rectifier and inverter, Equivalent circuit of HVDC Link.

UNIT – III

High Voltage DC Transmission – II

Desired features and means of control, control of the direct current transmission link, Constant current control, Constant ignition angle control, Constant extinction angle control, Converter firing- angle control-IPC and EPC, frequency control and Tap changer control, Starting, Stopping and Reversal of power flow in HVDC links.

UNIT – IV

Flexible AC Transmission Systems-I

Types of FACTS Controllers, brief description about various types of FACTS controllers, Operation of 6-pulse converter, Transformer Connections for 12-pulse, 24-pulse and 48-pulse operation, principle of operation of various types of Controllable shunt VAR Generation,

Principle of switching converter type shunt compensator, principles of operation of various types of Controllable Series VAR Generation, Principle of Switching Converter type series compensator.

UNIT – V

Flexible AC Transmission Systems-II

Unified Power Flow Controller (UPFC) – Principle of operation, Transmission Control Capabilities, Independent Real and Reactive Power Flow Control; Interline Power Flow Controller (IPFC) – Principle of operation and Characteristics, UPFC and IPFC control structures (only block diagram description), objectives and approaches of voltage and phase angle regulators.

Text Books:

1. Narain G. Hingorani and Laszlo Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, Wiley-Inter science, New Jersey, 2000.
2. E.W. Kimbark, Direct current transmission, Vol. I, Wiley Inter science, New York, 1971.

Reference Books:

1. K R Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International Publishers, New Delhi, 2007.
2. AnriqueAcha, Claudio R. Fuerte-Esquivel, Hugo Ambriz-Pérez and César Angeles-Camacho, FACTS: Modelling and Simulation in Power Networks, John Wiley & Sons, West Sussex, 2004.
3. R Mohan Mathur and Rajiv K Varma, Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2002.

Web References:

1. https://nptel.ac.in/courses/108104013,
2. https://nptel.ac.in/courses/108107114

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

UTILIZATION OF ELECTRICAL ENERGY (UEE)								
VII Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE405	**Professional Elective- V**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration:2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand the types of electric drives, load and their characteristics.

CO2: Understand the different types of heating and welding techniques.

CO3: Design illumination system for various lighting systems.

CO4: Understand the concept of electric traction.

CO5: Understand the principle of electrolytic process and fuel cell.

UNIT – I

Electric Drives

Type of electric drives – rating and choice of motor - starting and running characteristics – particular applications of electric drives - types of industrial loads - Continuous - intermittent and variable loads.

UNIT – II

Electric Heating & Welding

Introduction: Advantages and methods of electric heating - resistance heating - induction heating and dielectric heating. Electric welding: Classification- resistance and arc welding - electric welding equipment - comparison between AC and DC Welding.

UNIT – III

Illumination

Introduction - terms used in illumination - laws of illumination - sources of light. Discharge lamps – mercury vapor and sodium vapor lamps–comparison between tungsten filament lamps and fluorescent tubes–compact fluorescent lamp–LED-Basic principles of light control-Types and design of good lighting system and practice - flood lighting

UNIT – IV

Electric Traction

Traction systems: System of electric traction and track electrification - Review of existing electric traction systems in India - Special features of traction motor - Speed-time curves for different services - methods of electric braking - plugging - rheostatic braking - regenerative braking. Introduction to Magnetic Levitation vehicles

UNIT – V

Electrolytic Process

Introduction - Basic principles - Faradays laws of electrolysis - Energy efficiency – Electrode position -Factors governing deposition Processes - Deposition of Alloys – Extraction and refining of metals. Fuel Cells.

Text Books:

1. C.L Wadhwa, Generation Distribution and Utilization of Electrical Energy, New age International Publishers,
2. J. B. Gupta, Utilization of Electrical Power and Electric Traction, S. K. Kataria and sons, 2002
3. G. C. Garg (2005), Utilization of Electrical Power & Electric traction, 8th edition, Khanna publishers, New Delhi.

Reference Books:

1. Partab (2007), Art & Science of Utilization of electrical Energy, 2nd edition, DhanpatRai& Sons, New Delhi.
2. Alan. V. Oppenheim, Ronald. W. Schafer, John R Buck, Discrete Time Signal Processing, Prentice Hall, 2nd edition, 2006. E. Open shaw Taylor, Utilization of Electric Energy, Orient Longman, 1971.

Web References:

1. https://nptel.ac.in/courses/108105060
2. https://nptel.ac.in/courses/112105221
3. https://vpmpee.wordpress.com/uee-3340903/

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

SWITCHED MODE POWER CONVERSION (SMPC)								
VII Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE406	**Professional Elective -V**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration:2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Analyze of various DC-DC converters

CO2: Analyze and design of various DC-DC converters, advanced converters of SMPCs

CO3: Evaluate the performance of resonant converters.

CO4: Analyze the performance characteristics of 1-ϕ and 3-ϕ inverters with single/multi levels, power conditioners, UPS and filters

CO5: Analyze various applications of the power electronic converters in Power Systems, EVE, renewable energy systems, etc

UNIT – I

DC-DC Converters

Principles of step-down and step-up converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters – Numerical Examples

UNIT – II

Switching Mode Power Converters

Analysis and state space modelling of flyback, Forward, Luo, Half bridge and full bridge converters- control circuits and PWM techniques – Numerical Examples

UNIT – III

Resonant Converters

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control – Numerical Examples

UNIT – IV

DC-AC Converters

Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT – V

Power Conditioners, UPS & Filters

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for

PE applications – Selection of capacitors.

Text Books:

1. Power Electronics: Essentials and Applications by L. Umanand, Wiley, 2009
2. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.
3. Course material on Switched Mode Power Conversion by V Ramanarayanan, Dept. of Electrical Engg. IISc. Bangalore.

Reference Books:

1. Philip T. Krein, ―Elements of Power Electronics‖, Oxford University Press, 2012
2. Ned Mohan, Tore.M. Undeland, William. P. Robbins, Power Electronics converters, Applications and design, 3rd Edition, John Wiley and Sons, 2006
3. M.H. Rashid, Power Electronics circuits, devices and applications, 3rd Edition Prentice Hall of India New Delhi, 2007.

Web References:

1. https://nptel.ac.in/courses/108108036
2. https://nptel.ac.in/courses/108105180

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ELECTRICAL DISTRIBUTION SYSTEM (EDS)								
VII Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE407	**Professional Elective-V**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration:2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand fundamental aspects of distribution system and various factors affecting the distribution systems

CO2: Analyze the distribution system, substation with various loads.

CO3: Understand the concept of distribution system load flows.

CO4: Design the voltage drop and power loss calculations for distribution systems.

CO5: Understand the concept of distribution automation and management systems.

UNIT – I

Distribution System Fundamentals

Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors effecting the primary feeder loading

UNIT – II

Distribution System Substations and Loads

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation, Service area with ―n‖ primary feeders, K constant, Radial feeder with uniformly and non-uniformly distributed loading. Benefits derived through optimal location of substations. Loads: Various types of loads, Definitions of various terms related to system loading, Distribution transformer loading, feeder loading, Relationship between the Load Factor and Loss Factor, Modelling of star and delta connected loads.

UNIT – III

Distribution System Load Flow

Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems

UNIT – IV

Voltage Drop and Power Loss Calculation

Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods,

Capacitor installation types, Series and Shunt Capacitors, Types of three-phase capacitor-bank connections, Procedure for best capacitor location, Economic justification for capacitors – Numerical problems.

UNIT – V

Distribution Automation

Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, Consumer Information Service (CIS) – Geographical Information System (GIS) – Automatic Meter Reading (AMR), Outage management, decision support applications, substation automation, control feeder automation.

Text Books:

1. Distribution System Modelling and Analysis, William H. Kersting, CRC Press, Newyork, 2002.
2. Electric Power Distribution System Engineering, TuranGonen, McGraw-Hill Inc., New Delhi, 1986.

Reference Books:

1. Control and automation of electrical power distribution systems, James Northcote-Green and Robert Wilson, CRC Press (Taylor & Francis), New York, 2007.
2. Biswarup Das, Power distribution Automation, IET publication, 2016.
3. Dr. M. K. Khedkar, Dr. G.M. Dhole, Electric Power Distribution Automation, Laxmi Publications, First edition, 2017.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ee126/preview

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

INTRODUCTION TO PYTHON PROGRAMMING (IPP)								
V Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
SCEE01	**Skill Enhancement Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		0	**1**	**2**	**2**	**30**	**70**	**100**
						End Exam Duration: 3 Hrs		

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

CO1: Understand fundamentals of programming–variables, conditions, Lists, Tuples & Dictionaries.

CO2: Understand Arithmetic, Relational, Assignment, Logical, Bitwise, Membership, Identity Operators and Conditional Statements.

CO3: Understand the concepts of Impart Functions, Scope of variables, Modules, Packages.

CO4: Understand Comprehend Concepts of File I/O, Exception Handling.

CO5: Understand the concept of classes, objects and develop general scientific programming through Matplotlib and NumPy.

UNIT – I

Introduction

History of Python, Features, Advantages, Environment setup and Interaction using Command prompt, IDLE, Script mode, IPython Notebook. Basic Syntax: Keywords, Identifiers, Variables.

Data Types

Strings, Numbers, Booleans, Date and Time, Lists, Tuples, Dictionaries

UNIT – II

Operators

Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators.

Program control

statements. Conditional Statements: if, if- else-elif, Loops: for, while Control Statements: break, continue, pass

UNIT – III

Functions

Defining Functions, Calling a Function, Function Arguments: Required arguments, Keyword arguments, Default Arguments, Variable-length arguments, Anonymous Functions, The Return Statement, Scope of the Variables in a Function - Global and Local Variables.

Modules

Defining module, name spacing, Importing modules and module attributes, from. Import statement, Module built-in functions, Introduction to Packages.

UNIT – IV

Error and Exception

Difference between an Error and Exception, Detecting and Handling Exceptions, Raising Exceptions, Assertions, Built-in Exceptions, User Defined Exceptions.

Files and Input/ Output

Opening and Closing Files, Reading and Writing Files, Renaming and DeletingFiles, Directories in Python.

UNIT – V

Classes and Objects

Overview of OOP terminology, Creating Classes, Creating Instance Objects, Inheritance, Overriding Methods, Overloading Methods, Operators, Data hiding.

Plotting Functions

Simple plotting with pylab: Basic plotting, Labels, legends and customization,
More advanced plotting

Matplotlib

Matplotlib basics, Contour plots, heat maps and 3D plots.

NumPy

Basic array methods, Reading and writing an array to a file, Statistical methods, Polynomial, Linear algebra, Matrices, Random sampling, Discrete Fourier transforms

Text Books:

1. Learning To Program With Python-2011 Richard L.Halterman
2. Learning Scientific Programming with Python, Christian Hill, Cambridge University Press (2016)
3. Introduction to Python for Computer Science and Data Science – 2021, Paul Deitel, Harvey Deitel
4. Python Crash Course: A Hands-On, Project-Based Introduction to Programming – 2019, Eric Matthes

Reference Books:

1. Python Programming-AnIntroductiontoComputerScience2nd edition-JohnZelle2010
2. Python-The Ultimate Beginner's Guide, Andrew Johansen
3. Core Python Programming, Wesley J. Chun, Pearson.

Web References:

1. https://www.tutorialspoint.com/python3/
2. https://realpython.com/
3. http://www.cs.uky.edu/~halterman/PythonBook/

APPLICATIONS OF SOFT COMPUTING TOOLS IN ELECTRICAL ENGINEERING (ASCTEE)								
VI Semester:EEE						**Scheme:2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
SCEE02	**Skill Enhancement Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		0	**1**	**2**	**2**	**30**	**70**	**100**
End Exam Duration:3 Hrs								

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

CO1: Understand the basics of soft computing tools.

CO2: Simulate power electronic converters and Drives

CO3: Analyze the concepts of power system

List of Experiments

Note: At least 10 of the following experiments shall be conducted

1. Calculation of basic electrical parameters in MATLAB Calculation of RMS, average values from instantaneous values. Calculation of active power reactive power and apparent power. Calculation of power factor.
2. Steady state and transient analysis of given electric circuit.
3. Simulation of 1-phase and 3-phase transformers
4. Simulation of buck and boost converter (MATLAB/Python)
5. Simulation Sine-PWM techniques for single-phase full-bridge and three-phase inverters
6. Simulation of cyclo-converter and AC voltage controller
7. Basic programming in Matlab
8. Simulation of AC to Dc converter (MATLAB/Python)
9. Design and analysis of hybrid renewable energy systems using system advisory model
10. Economic Load Dispatch of (i) Thermal Units and (ii) Thermal Plants using Conventional Method.
11. Reactive Power Control in a transmission system (Ferranti effect, Effect of shunt Inductor)
12. Fault studies using Z-bus matrix
13. Speed control of DC drive
14. Speed control of AC drive
15. Close control of a drive using Fuzzy controller.

POWER SYSTEMS AND SIMULATION LAB (PSS (P))								
VII Semester:EEE						Scheme:2023		
Course Code	Category	Hours/ Week			Credits	Maximum Marks		
SCEE03	Skill Enhancement Course	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
		0	0	4	2	30	70	100
End Exam Duration:3 Hrs								

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

CO1: Analyze the characteristics of different types of electromagnetic and numeric relays

CO2: Analyze the power system network for different conditions and Ferranti effects on long transmission

CO3: Analyze the sequence impedances of synchronous machines and transformers.

CO4: To study the fault analysis of an unloaded alternator.

CO5: Apply modern Engineering tool ETAP for solving Power System problems.

List of Experiments

Note: At least 10 of the following experiments shall be conducted

1. IDMT over Current Relay.
2. Micro processor based IDMT Over current relay
3. Directional IDMT Over Current relay
4. Micro Processor Based Directional Over current Relay
5. Inverse Time over Current Relay.
6. 220 kV-180km EHV-AC Long Transmission Line Simulator (Voltage regulation and determination of surge Impedance).
7. Determination of +ve, -ve and zero sequence impedances of 3-phase alternator.
8. Load flow analysis using ETAP.
9. Short circuit analysis using ETAP.
10. Harmonic Analysis using ETAP.
11. Determination of Transient Stability (Equal Area Criterion and Swing Equation) using ETAP.
12. Optimal Power flow using ETAP
13. Determination of +ve, -ve and zero sequence impedances of 3-phase Transformer
14. Fault analysis of a 3-phase unloaded alternator.
15. Determination of dielectric strength of transformer oil.

TECHNICAL PAPER WRITING & IPR (TPWIPR)

VI Semester: EEE | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
AC301	Audit Course	2	0	0	-	-	-	-

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

CO1: Develop precise and ethical technical writing with logical structure and critical analysis.

CO2: Formulate and present structured research content and synopsis.

CO3: Understand and apply the principles of publishing, journal types, indexing with proper citation and plagiarism standards

CO4: Understand fundamental knowledge of intellectual property rights, international Frame works and registration of trademarks.

CO5: Understand the fundamentals of laws of copyrights and patents, intellectual property audits.

UNIT – I

Principles of Technical Writing

Styles in technical writing; clarity, precision, coherence and logical sequence in writing, avoiding ambiguity, repetition, and vague language, highlighting your findings, discussing your limitations, hedging and criticizing, plagiarism and paraphrasing.

UNIT – II

Technical Research Paper Writing

Abstract, Objectives, Limitations, Review of Literature, Problems and Framing Research Questions, Synopsis.

UNIT – III

Process of research: publication mechanism

Types of journals, indexing, seminars, conferences, proof reading, plagiarism style; seminar & conference paper writing; Methodology, discussion, results and citation rules.

UNIT – IV

Introduction to Intellectual property

Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT – V

Law of copy rights

Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law

Law of patents

Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

Text Books:
1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013
2.Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and practices. Oxford.
Reference Books:
1. R. Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. PrabuddhaGanguli, Intellectual Property Rights Tata Mcgraw Hill, 2001
3. Adrian Wallwork. English for Writing Research Papers, Second Edition. Springer Cham Heidelberg New York ,2016
Online Resources:
1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2. https://lawbhoomi.com/intellectual-property-rights-notes/
3. https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf

GENDER SENSITIZATION (GS)

VII Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
AC401	Audit Course	2	0	0	-	-	-	-

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

CO1: Understand the basic concepts of gender and its related terminology

CO2: Identify the biological, sociological, psychological and legal aspects of gender.

CO3: Analyze the gendered division of labour and its relation to politics and economics.

CO4: Understand how gender discrimination operates in our society and how to counter it.

CO5: Appraise how the various mass/ electronic and print media perpetuate gender stereotypes of men and women to the detriment of the well-being of society.

UNIT – I

UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT – II

GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences-Declining Sex Ratio- Demographic Consequences-Gender Spectrum.

UNIT – III

GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor-My Mother doesn‘t Work. - Share the Load-Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work - Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT – IV

GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence.

UNIT – V

GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular

Literature- Gender Development Issues-Gender Issues - Gender Sensitive Language- Just Relationships
Text Books:
1. A. Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender‖, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990
Reference Books:
1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, AnupamaSihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019
6. A.Revathy&Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016
Web References:
1. Understanding Gender chrome-extension://kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. Gender Roles and Relations https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and stereotypes https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408
3. Gender and Labour https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be redressed, https://onlinecourses.nptel.ac.in/noc23_mg67/preview
4. GENDER-BASED VIOLENCE https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

CONSTITUTION OF INDIA (COI)								
VII Semester: EEE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
AC402	**Audit Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		2	**-**	**-**	**-**	**-**	**-**	**-**

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

CO1: Explain the historical context and foundational principles of the Indian Constitution, including its formation and significance.

CO2: Describe the structure and functions of the Union and State Executive, including the roles of key constitutional functionaries.

CO3: Analyze key constitutional amendments (42nd, 44th, 74th, 76th, 86th, and 91st) and assess the nature of Centre-State relations and President's Rule.

CO4: Interpret the diversity of Indian society, including linguistic plurality, and evaluate the rights and constitutional safeguards for women, SCs, STs, and other weaker sections.

CO5: Examine the structure and independence of the judiciary and evaluate the role of various courts in upholding constitutional values through judicial review.

UNIT – I

Historical back ground – Significance of Constitution – Making of the constitution – Role of the Constituent Assembly – Salient features – Preamble – Citizenship – Procedure for amendment of Constitution – Fundamental rights – Derivative Principles of state policy – Elections in India.

UNIT - II

Union Executive: Structure of the Union Government & its functions – President – VicePresident – Prime Minister – Cabinet – Parliament. State Executive: Structure and functions – Governor – Chief Minister – Cabinet – State Legislature.

UNIT – III

Central-State Relations, President's Rule – Constitutional Amendments [42, 44, 74, 76, 86 & 91] – Constitutional functionaries – Working of Parliamentary system in India.

UNIT – IV

Indian Social Structure – Languages in India – Political Parties & Pressure groups – Rights of Women – SCs, STs& other weaker sections.

UNIT – V

Judiciary: Structure, Organization of Judiciary – Independence of the Judiciary – Role and functions of Supreme Court, High Courts & Sub ordinate Courts – Judicial Review.

Text Books:

1. Durga Das Basu, Introduction to the Constitution of India, Wadwa& Company
2. Macivel, Page, An Introduction Analysis Society
3. M.V. Pylee, Indian Constitution, S. Chand Publications
4. Subhash C Kashyap, Our Constitution, National Book Trust of India.
5. Dr. S.M.Rajan ,Constitutional Law of India

Reference Books:

1. The Constitution of India, By the Ministry of Law and Justice, The Govt. of India.
2. C. KashyapSubhasah, Constitutional Law of India
3. M.P.Jain, Indian Constitution Law
4. H.M. Seervai, Constitutional Law of India
5. Brij Kishore Sharma, Introduction to the Constitution of India, PHI Learning
Web References:
1. https://www.india.gov.in/my-government/constitution-india
2. https://prsindia.org
3. https://main.sci.gov.in

BUSINESS ETHICS AND CORPORATE GOVERNANCE (BECG)

VII Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
HSM401	BS&H	2	0	0	2	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand loyalty and ethics; identify different ethical frameworks, and analyze ethical challenges in management crises.

CO2: Understand ethics in management, compare professional vs. technical ethics, and cultivate ethical values personally and organizationally.

CO3: Understand corporate culture, its core elements, and how leadership influences it.

CO4: Apply law and ethics to analyze fair trade and environmental protection practices.

CO5: Apply corporate governance codes, analyze stakeholder roles, and implement CSR in India.

UNIT – I

ETHICS

Introduction – Meaning– Nature, Scope, significance, Loyalty, and ethical behavior. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management –Corporate Social Responsibility– Issues of Management – Crisis Management

UNIT – II

ETHICS IN MANAGEMENT

Introduction: Ethics in production, finance, Human resource management and Marketing Management – The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

UNIT – III

CORPORATE CULTURE

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

UNIT – IV

LEGAL FRAMEWORK

Law and Ethics - Agencies enforcing Ethical Business Behavior -Legal Impact – Environmental

Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

UNIT – V

CORPORATE GOVERNANCE

Introduction - Meaning– Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory framework – Corporate scams - Committees in India and abroad, corporate social responsibility. BoD's composition, Cadbury Committee – Various committees - Reports- Benefits and Limitations.

Text Books:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. BholananthDutta, S.K. Podder – Corporation Governance, VBH .June 2010

Reference Books:

1. Dr. K. Nirmala, Karunakara Reddy .Business Ethics and Corporate Governance, HPH
2. R. Machiraju: Corporate Governance, HPH,2013
3. K. Venkataramana, Corporate Governance, SHBP.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. https://archive.nptel.ac.in/courses/110/105/110105138/
3. https://onlinecourses.nptel.ac.in/noc21_mg54/

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

E-BUSINESS (EB)

VII Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
HSM402	BS&H	2	0	0	2	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1: Understand the concept of e-business, compare it with e-commerce, and evaluate its Industry opportunities.

CO2: Understand business models, compare portal types, and analyze B2B, B2C, and B2G models.

CO3: Analyze electronic payment systems by understanding EFT, smart cards, debit, and credit cards.

CO4: Evaluate e-security measures by understanding security protocols, public networks, and digital signatures.

CO5: Apply online marketing concepts and compare e-CRM and e-SCM.

UNIT – I

Electronic Business

Introduction – Nature, meaning, significance, functions, and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce –E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

UNIT – II

Electronic Markets and Business Models

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

UNIT – III

Electronic Payment Systems

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage - Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

UNIT – IV

E-Security

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms.

UNIT – V

E-Marketing

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research–E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (E-CRM) E-supply chain management (E-SCM)

Text Books:

1. AratiOturkar&SunilKhilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

Reference Books:

1. Debjani, Kamalesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill's, 2005
2. Dave Chaffey.E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan. E-Commerce Fundamentals and Application, Raymond LeathamWiley India 2007
4. S. Jaiswal. E-Commerce GalgotiaPublicationPvt Ltd., 2003.

Web References:

1. https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
2. https://www.slideshare.net/VikramNani/e-commerce-business-models
3. https://www.slideshare.net/RiteshGoyal/electronic-payment-system
4. https://www.slideshare.net/WelingkarDLP/electronic-security
5. https://www.slideshare.net/Ankitha2404/emarketing-ppt

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

MANAGEMENT SCIENCE (MS)

VII Semester: EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
HSM403	BS&H	2	0	0	2	30	70	100

Sessional Exam Duration:2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1: Understand core management concepts, theories, organizational structures, and the role of social responsibility for effective management.

CO2: Understand the essential operations management principles and apply marketing mix strategies in the industry.

CO3: Understand key HRM concepts and functions and apply these practices to effectively manage the complete employee lifecycle within an organization.

CO4: Apply SWOT analysis, PERT and CPM techniques to strengthen project strategy formulation

CO5: Apply the advanced management systems to enhance organizational quality, efficiency, innovation and social responsibility.

UNIT – I

INTRODUCTIONTO MANAGEMENT

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor‘s Scientific Theory-Henry Fayols’ principles - Elton Mayo‘s Human relations -Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

UNIT – II

OPERATIONS MANAGEMENT

Principles and Types of Plant Layout -Methods of Production (Job, batch, and Mass Production), Work Study - Statistical Quality Control- Material Management: Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis. Marketing Management: Concept – Meaning – Nature – Functions of Marketing – Marketing Mix - Channels of Distribution Advertisement and Sales Promotion -Marketing Strategies based on Product Life Cycle.

UNIT – III

HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection -Process -Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

UNIT – IV

STRATEGIC & PROJECT MANAGEMENT

Definition & Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process – Environmental Scanning –Steps in Strategy Formulation and Implementation – SWOT Analysis- Project Management - Network Analysis - Program Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

UNIT – V

CONTEMPORARY ISSUES IN MANAGEMENT

Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management – sustainability and corporate social responsibility.

Text Books:

1. Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023
2. A.R Aryasri, Management Science, TMH, 2019

Reference Books:

1. Stoner, Freeman, Gilbert. *Management, Pearson* Education, New Delhi, 2019.
2. Koontz &Weihrich, *Essentials ofManagement*,6/e, TMH, 2005.
3. Thomas N.Duening&JohnM.Ivancevich, *Management Principles and Guidelines*, Biztantra

Web References:

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043
2. https://nptel.ac.in/courses/112107238
3. https://archive.nptel.ac.in/courses/110/104/110104068/

Question Paper Pattern:

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

Open Elective – I

S. No.	Course Name	Offering Department	Eligible Branches
1	Green Buildings	CE	All Branches
2	Construction Technology and Management	CE	All Branches Except CE
3	Electrical Safety Practices and Standards	EEE	All Branches Except EEE
4	Sustainable Energy Technologies	ME	All Branches Except ME
5	Electronic Circuits	ECE	All Branches Except ECE
6	Java Programming	CSE	CE, EEE, ME and ECE
7	Foundations of Artificial Intelligence	CSE	CE, EEE and ECE
8	Ethical Hacking	CSE	All Branches
9	Mathematics for Machine Learning and AI	HBS	All Branches
10	Materials Characterization Techniques		
11	Chemistry of Energy Systems		
12	English for Competitive Examinations		
13	Entrepreneurship and New Venture Creation		

GREEN BUILDINGS (GB)

V Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE501	OE-I	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Understand the importance of green buildings, their necessity, and sustainable features
CO2:	Analyze various green building practices, rating systems, and their impact on environmental sustainability.
CO3:	Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.
CO4:	Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.
CO5:	Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.

UNIT – I

Introduction to Green Building: Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing a Green Building, Important Sustainable Features for Green Buildings.

UNIT – II

Green Building Concepts and Practices: Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Green Building Rating Systems, Residential Sector, Market Transformation

Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED India Rating System, and Energy Efficiency.

UNIT – III

Green Building Design: Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT – IV

Air Conditioning: Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT – V

Material Conservation: Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture.

Indoor Environment Quality and Occupational Health: Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.

Text Books:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by Tomwoolley and Samkimings, 2009.

Reference Books:

1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code–ECBC-2020, published by BEE
4. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S NanjundaRao – New Age International Publishers
5. Non-conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age International Publishers

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/105/102/105102195/
2. https://igbc.in/resources
3. https://www.grihaindia.org/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

CONSTRUCTION TECHNOLOGY AND MANAGEMENT (CTM)

V Semester: All Branches Except CE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE502	OE-I	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understand project management fundamentals, organizational structures, and leadership principles in construction.
CO2:	Solve and formulate network analysis in CPM and PERT networks.
CO3:	Understand the structure of organization and resource allocation
CO4:	Evaluate various contract types, contract formation, and legal aspects in construction management
CO5:	Assess safety management practices, accident prevention strategies, and quality management systems in construction

UNIT – I

Introduction: Management Objectives and Functions; Stages of Project Management - Types of Organization, Organizational Chart of a Construction Company – Team of Construction Unit - Manager's Duties and Responsibilities.

Construction Planning and Scheduling: Objectives and importance of planning and scheduling – Methods of Planning and Scheduling.

UNIT – II

Network Techniques in Construction management: Elements of network – Network techniques – Breakdown structures – Representation and specifying of activities and events – Rules for Network.

Critical Path Method (CPM): Introduction – Difference between CPM and PERT – Time estimates – Float – Critical path – Network analysis and computation problems.

UNIT – III

Program Evaluation and Review Technique (PERT): Introduction, time estimates, slack, critical path – Network analysis and computation problems.

Cost–Time Analysis in Net Work Planning: Importance of time – Project cost analysis innetwork planning – Updating – Resources allocation.

UNIT – IV

Tenders and Contracts: Type of tenders – Principles of tendering – Notice inviting tender – Contracts definition – Essentials – Types – Documents – Conditions of contracts.

Arbitration: Definition – Arbitrator – Arbitration agreement – Qualification of arbitrator – Advantages of arbitration.

UNIT – V

Safety Management: Implementation and Application of QMS, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety.

Text Books:
1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016.
2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019
3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd.
Reference Books:
1. Brien, J.O. andPlotnick, F.L., CPMin Construction Management, Mcgraw Hill, 2010.
2. Punmia, B.C., andKhandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.
3. Construction Methods and Management: Pearson New International Edition 8 th Edition Stephens Nunnally.
4. Rhoden, M and Cato B, Construction Management andOrganisational Behaviour, Wiley-Blackwell, 2016.
Online Learning Resources:
1. https://archive.nptel.ac.in/courses/105/104/105104161/
2. https://archive.nptel.ac.in/courses/105/103/105103093/
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions. **End Examination:** The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

ELECTRICAL SAFETY PRACTICES AND STANDARDS (ESPS)

V Semester: All Branches Except EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE503	OE-I	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understanding the Fundamentals of Electrical Safety
CO2:	Identifying and Applying Safety Components
CO3:	Analyzing Grounding Practices and Electrical Bonding
CO4:	Applying Safety Practices in Electrical Installations and Environments
CO5:	Evaluating Electrical Safety Standards and Regulatory Compliance

UNIT – I

Introduction To Electrical Safety: Fundamentals of Electrical Safety-Electric Shock-physiological effects of electric current - Safety requirements –Hazards of electricity- Arc - Blast- Causes for electrical failure.

UNIT – II

Safety Components: Introduction to conductors and insulators- voltage classification - safety against over voltages- safety against static electricity-Electrical safety equipment‘s - Fire extinguishers for electrical safety.

UNIT – III

Grounding: General requirements for grounding and bonding- Definitions- System grounding-Equipment grounding - The Earth - Earthing practices- Determining safe approach distance-Determining arc hazard category.

UNIT – IV

Safety Practices: General first aid- Safety in handling hand held electrical appliances tools-Electrical safety in train stations-swimming pools, external lighting installations, medical locations-Case studies.

UNIT – V

Standards For Electrical Safety: Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electrical inspectorate

Text Books:

1. Massimo A.G.Mitolo, “Electrical Safety of Low-Voltage Systems”, McGraw Hill, USA, 2009.
2. Mohamed El-Sharkawi, “Electric Safety - Practice and Standards”, CRC Press, USA, 2014.

Reference Books:

1. Kenneth G.Mastrullo, Ray A. Jones, “The Electrical Safety Program Book”, Jones and Bartlett Publishers, London, 2nd Edition, 2011.
2. Palmer Hickman, “Electrical Safety-Related Work Practices”, Jones & Bartlett

Publishers, London, 2009.

3. Fordham Cooper, W., "Electrical Safety Engineering", Butterworth and Company, London, 1986.

4. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, "Electrical Safety Hand book", McGraw-Hill, New York, USA, 4th edition, 2012.

Online Learning Resources:

1. https://onlinecourses.swayam2.ac.in/nou25_ec08/preview

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

SUSTAINABLE ENERGY TECHNOLOGIES (SET)

V Semester: All Branches Except ME | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE504	OE-I	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understand the importance of solar radiation and solar PV modules.
CO2:	Describe the storage methods in PV systems
CO3:	Explain the solar energy storage for different applications
CO4:	Illustrate the principles of wind energy, and bio-mass energy.
CO5:	Attain knowledge in geothermal energy, ocean energy and fuel cells.

UNIT – I

Solar Radiation: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

Solar PV Modules and PV Systems: PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance.

UNIT – II

Storage in PV Systems: Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT – III

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

Solar Energy Storage and Applications: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT – IV

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

Bio-Mass: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

UNIT – V

Geothermal Energy: Origin, Applications, Types of Geothermal Resources, Relative Merits. **Ocean Energy**: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges.

Fuel Cells: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

Text Books:

1. Sukhatme S.P. and J.K.Nayak , Solar Energy – Principles of Thermal Collection and Storage, TMH, 2009
2. Khan B.H , Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi,2006
3. Twidell & Weir, Renewable Energy Sources , Taylor and Francis / 2nd Special Indian Edition,2006
4. G.N Tiwari and M.K.Ghosal , Fundamentals of Renewable Energy Sources, Alpha Science International Limited, 2007

Reference Books:

1. D.Yogi Goswami, Frank Krieth& John F Kreider , Principles of Solar Engineering , Taylor & Francis,2015
2. Ashok V Desai ,Non-Conventional Energy , New Age International (P) Ltd,1990
3. R. Ramesh & K. Uday Kumar,Renewable Energy Technologies, Narosa Publishing,1997
4. G.D Roy , Non-conventional Energy Source, Standard Publishers,2004
5. Anjaneyulu & Francis , Energy Resources Utilization and Technologies , BS Publications/2012.
6. Frank Krieth & John F Kreider, Principles of Solar Energy, Hemisphere Publications.2000

Online Learning Resources:

1. https://nptel.ac.in/courses/112106318

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

ELECTRONIC CIRCUITS (EC)

V Semester: All Branches Except ECE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE505	OE-I	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Illustrate the VI Characteristics of Diode and special purpose diodes, Design rectifiers, wave shaping circuits and describe the behavior of special purpose diodes.
CO2:	Explore the operation, configurations, and biasing of BJTs.
CO3:	Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.
CO4:	Understand the operation, applications and uses of feedback amplifiers and oscillators
CO5:	Analyze the characteristics, configurations, and applications of operational amplifiers.

UNIT – I

Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode

UNIT – II

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

UNIT – III

Single Stage Amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

Multistage Amplifiers: Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

UNIT – IV

Feedback Amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.

UNIT – V
Op-amp: Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential. **Applications of Op-amp:** Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.
Text Books:
1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008.
Reference Books:
1. Electronics Devices and Circuits Theory, R.L.Boylestad, LousisNashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press.
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions. **End Examination:** The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

JAVA PROGRAMMING (JP)

V Semester: CE, EEE, ME and ECE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE506	OE-I	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.
CO2:	Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects
CO3:	Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
CO4:	Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
CO5:	Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX
CO6:	Choose appropriate data structure of Java to solve a problem

UNIT – I

Object Oriented Programming: Basic concepts, Features of Java , Principles

Program Structure in Java: Introduction, Writing Simple Java Programs, Java Statements

Data Types, **Variables, and Operators:** Introduction, Data Types in Java, Declaration of Variables, Type Casting, Scope of Variable Identifier, Variables, Constants, Scope and Lifetime of variables, Operators, Type conversion and casting

Introduction to Operators: Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (--) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bit-wise Logical Operators.

Control Statements: Introduction, Control Statements- If Nested loops, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop

UNIT – II

Classes and Objects: Introduction to Classes: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Constructor Methods for Class, , Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this, finalize and Wrapper classes

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, , Attributes Final and Static.

UNIT – III

Arrays: Introduction, Declaration and Initialization of Arrays, Memory Storage & Access, Array Operations, Arrays as Vectors. Two dimensional Arrays, Arrays of Varying Lengths, Three dimensional Arrays.

Inheritance: Introduction, Access Control and Types of Inheritance, Multilevel and Hierarchical Inheritance, Final and Super keywords, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, , Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT – IV

Packages and Java Library :Packages:

Introduction, Defining Package, Importing Packages and Classes into Programs, Access Control, Packages in Java SE, Class Object, Enumeration, class Math, Wrapper Classes, Java util Classes and Interfaces, Formatter Class, Random Class, Formatting for Date/Time in Java

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throw able, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams.

UNIT – V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Java thread model, Creating a thread-Extending Thread class and Implementing Runnable interface, Thread life cycle, Thread class methods, Thread priorities, Deadlocks in Threads, Thread Synchronization and Inter Thread Communication

Java Database Connectivity: Introduction, JDBC Architecture, Installing My SQL and My SQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

Text Books:

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

Reference Books:

1. The complete Reference Java, 11thedition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0128804645476 18816347 _shared/overview

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any

one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

FOUNDATIONS OF ARTIFICIAL INTELLIGENCE (FAI)

V Semester: CE, EEE and ECE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE507	OE-I	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
CO2:	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
CO3:	Learn different knowledge representation techniques.
CO4:	Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
CO5:	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
CO6:	Analyze Supervised Learning Vs. Learning Decision Trees.

UNIT – I

Introduction to AI: Intelligent Agents, Problem-Solving Agents.

Searching for Solutions: Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

UNIT – II

Games: Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic- Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT – III

First-Order Logic: Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution. **Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.

UNIT – IV

Planning: Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

UNIT – V

Probabilistic Reasoning: Acting under Uncertainty, Basic Probability Notation Bayes‘ Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

Text Books:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

Reference Books:

1. Artificial Intelligence, 3rd Edition, E. Rich and K. Knight (TMH).
2. Artificial Intelligence, 3rd Edition, Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

Online Learning Resources:

1. https://swayam.gov.in/nd1_noc19_me71/preview
2. https://ai.google/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

ETHICAL HACKING (EH)

V Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE508	OE-I	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand the basics of security and ethical hacking.
CO2:	Understand about foot printing and types of attacks in social engineering.
CO3:	Understand about sniffers, hijacking and DoS attacks.
CO4:	Understand the importance of web server hacking, database hacking and SQL Injection.
CO5:	Understand about Wireless technologies, intrusion detection and firewalls.

UNIT – I

Introduction to Ethical Hacking: Introduction, Security fundamentals, Security testing, Hackers and crackers description, Ethical Hackers.

Technical Foundations of Hacking: The Hacking process, Information Security Systems and the Stack.

UNIT – II

Foot printing: Information Gathering Methodology , OS Fingerprinting, Fingerprinting Services, Enumeration, System Hacking.

Social Engineering: Social Engineering, Malware threats, Vulnerability analysis.

UNIT – III

Sniffers: Passive sniffing, Active sniffing, ARP,ARP poisoning and MAC flooding, tools for sniffing, wire shark, sniffing and spoofing countermeasures.

Session Hijacking: Transport layer Hijacking, Application layer Hijacking, Session Hijacking **Tools. Denial of Service:** DoS attack techniques, Distributed DoS, DDoS tools.

UNIT – IV

Web Server Hacking: HTTP protocol, scanning web servers, Banner grabbing and Enumeration, Web server, DoS/ DDoS and DNS attacks.

Database Hacking: Introduction to SQL and SQL injection and categories, Finger printing, UNION Exploitation technique, Boolean in SQL injection attacks, Out-of band exploitation, exploring the time-delay SQL injection technique, Stored procedure SQL injection and mitigations, SQL injection hacking tools.

UNIT – V

Wireless Technologies, Mobile Security: Mobile device operation and security, Wireless LAN's- Basics, Wireless LAN frequencies and signalling, Wireless LAN security.

IDS: Intrusion Detection and Prevention Systems. Firewalls and Honey pots.

Text Books:

1. Micheal Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson education, 2020.

Reference Books:

1. EC-Council, "Ethical Hacking and Counter measures (CEH)",CENGAGE Learning, 2020
2. Sai Satish, "Hacking Secrets Part-1", Indian Servers, 2018.
3. David Litchfield, Chris Anley "The Database Hackers Handbook: Defending Database Servers", Wiley.

Online Learning Resources:

1. https://www.coursera.org/courses?query=ethical%20hacking
2. https://onlinecourses.nptel.ac.in/noc22_cs13/preview
3. https://www.geeksforgeeks.org/ethical-hacking-tutorial/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

MATHEMATICS FOR MACHINE LEARNING AND AI (MMLA)

V Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE509	OE-I	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Apply linear algebra concepts to ML techniques like PCA and regression
CO2:	Analyze probabilistic models and statistical methods for AI applications.
CO3:	Implement optimization techniques for machine learning algorithms.
CO4:	Utilize vector calculus and transformations in AI-based models.
CO5:	Develop graph-based AI models using mathematical representations.

UNIT – I

Linear Algebra for Machine Learning: Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigen values, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

UNIT – II

Probability and Statistics for AI: Probability distributions: Gaussian, Binomial, Poisson. Bayes‘ Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP).Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

UNIT – III

Optimization Techniques for ML: Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton‘s method, BFGS method.

UNIT – IV

Vector Calculus & Transformations: Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications

UNIT – V

Graph Theory for AI: Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

Text Books:

1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.
2. Pattern Recognition and Machine Learningby Christopher Bishop, Springer.

Reference Books:

1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.
2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

Online Learning Resources:

1. https://ocw.mit.eduhttps://
2. https://cs229.stanford.edu/
3. https://deepai.org

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MATERIALS CHARACTERIZATION TECHNIQUES (MCT)

V Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE510	OE-I	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Analyze the crystal structure and crystallite size by various methods
CO2:	Analyze the morphology of the sample by using a Scanning Electron Microscope
CO3:	Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope
CO4:	Explain the principle and experimental arrangement of various spectroscopic techniques
CO5:	Identify the construction and working principle of various Electrical & Magnetic Characterization technique

UNIT – I

Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT – II

Microscopy technique -1 –Scanning Electron Microscopy (SEM): Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT – III

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

UNIT – IV

Spectroscopy techniques: Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT – V

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

Text Books:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods –

Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013.

2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

Reference Books:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall , 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.
4. Materials Characterization Techniques -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008

Online Learning Resources:

1. https://nptel.ac.in/courses/115/103/115103030/
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

CHEMISTRY OF ENERGY SYSTEMS (CES)

V Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE511	OE-I	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Solve the problems based on electrode potential, Describe the Galvanic Cell, Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer
CO2:	Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell, Discuss about the Basic design of fuel cells, Classify the fuel cell
CO3:	Differentiate between Photo and Photo electro chemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions, Interpret advantages of photo electron catalytic conversion.
CO4:	Apply the photovoltaic technology, Demonstrate about solar energy and prospects Illustrate the Solar cells, Discuss about concentrated solar power
CO5:	Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic framework, Illustrate the carbon and metal oxide porous structures, Describe the liquification methods.

UNIT – I

Electrochemical Systems: Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction, Lead-acid, Nickel- cadmium, Lithium ion batteries and their applications.

UNIT – II

Fuel Cells: Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

UNIT – III

Photo and Photo electrochemical Conversions: Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.

UNIT – IV

Solar Energy: Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications

UNIT – V

Hydrogen Storage: Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers.

Text Books:

1. Physical chemistry by Ira N. Levine

2.	Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3.	Inorganic Chemistry, Silver and Atkins
Reference Books:	
1.	Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services And corporation)
2.	Hand book of solar energy and applications by ArvindTiwari and Shyam.
3.	Solar energy fundamental, technology and systems by Klaus Jagar et.al.
4.	Hydrogen storage by Levine Klebonoff
Question Paper Pattern:	

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

ENGLISH FOR COMPETITIVE EXAMINATIONS (ECE)

V Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE512	OE-I	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Identify the basics of English grammar and its importance
CO2:	Explain the use of grammatical structures in sentences
CO3:	Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams
CO4:	Analyze an unknown passage and reach conclusions about it
CO5:	Choose the appropriate form of verbs in framing sentences
CO6:	Develop speed reading and comprehending ability thereby perform better in competitive exams

UNIT – I

Grammar - I: Nouns-classification-errors, Pronouns-types-errors, Adjectives-types-errors, Articles-definite indefinite, Degrees of Comparison, Adverbs-types- errors, Conjunctions-usage Prepositions-usage, Tag Questions, types-identifying errors- Practice

UNIT – II

Grammar - II: Verbs-tenses- structure-usages- negatives- positives- time adverbs, Sequence of tenses--If Clause, Voice-active voice and passive voice, reported Speech, Agreement-subject and verb Modals-Spotting Errors-Practices

UNIT – III

Verbal Ability: Sentence completion-Verbal analogies-Word groups-Instructions, Critical reasoning-Verbal deduction-Select appropriate pair, Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.

UNIT – IV

Reading Comprehension and Vocabulary: Competitive Vocabulary :Word Building – Memory techniques, Synonyms, Antonyms, Affixes-Prefix &Suffix, One word substitutes, Compound words, Phrasal Verbs, Idioms and Phrases, Homophones, Linking Words, Modifiers, Intensifiers - Mastering Competitive Vocabulary, Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering–Elimination methods

UNIT – V

Writing for Competitive Examinations: Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing Expansion of proverbs- Essay writing-types

Text Books:

1. Wren & Martin, English for Competitive Examinations, S.Chand & Co, 2021.
2. Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014

Reference Books:

1. Hari Mohan Prasad, Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.
2. Philip Sunil Solomon, English for Success in Competitive Exams, Oxford 2016
3. Shalini Verma , Word Power Made Handy, S Chand Publications
4. Neira, Anjana Dev & Co. Creative Writing: A Beginner's Manual. Pearson Education India, 2008.
5. Abhishek Jain,Vocabulary Learning Techniques Vol.I&II,RR Global Publishers 2013.
6. Michel Swan, Practical English Usage,Oxford,2006.

Online Learning Resources:

1. https://www.grammar.cl/english/parts-of-speech.htm
2. https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech
3. https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice
4. https://languagetool.org/insights/post/verb-tenses/
5. https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council
6. https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx

Question Paper Pattern:

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

ENTREPRENEURSHIP AND NEW VENTURE CREATION (ENVC)								
V Semester: All Branches						**Scheme:** 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OE513	**OE-I**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration:** 3 Hrs		

Course Outcomes : At the end of the course, students will be able to	
CO1:	Understand the concept of entrepreneurship, analyze its role in economic development, and develop a creative mindset for starting a business.
CO2:	Understand customer problems, validate them with potential customers, and evaluate customer segments and personas.
CO3:	Evaluate customer needs through jobs-to-be-done analysis and develop value propositions using prototypes and MVPs.
CO4:	Apply lean business models, financial and sales plans to design a venture with suitable funding and marketing channels.
CO5:	Analyze scaling aspirations and venture components to develop an investor-ready pitch

UNIT – I

Entrepreneurship Fundamentals and Context: Meaning and concept, attributes and mindset of entrepreneurial and entrepreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.

UNIT – II

Problem & Customer Identification: Understanding and analyzing the macro-Problem and Industry perspective - technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion –identifying and defining problem using Design thinking principles –Analyzing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.

UNIT – III

Solution Design, Prototyping & Opportunity Assessment and Sizing: Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.

UNIT – IV

Business & Financial Model, Go-To-Market Plan: Introduction to Business model and types, Lean approach,9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach. Business planning: components of Business plan- Sales plan, People plan and financial plan. Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding

basics of Unit economics and analyzing financial performance. Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity Map the Start-up Life-cycle to Funding Options.

UNIT – V

Scale Outlook and Venture Pitch Readiness: Understand and identify potential and aspiration for scale vis-a-vis your venture idea. Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

Text Books:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha. Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E.The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business, (2011).

Reference Books:

1. Simon Sinek,Start with Why, Penguin Books limited. (2011)
2. Brown Tim,Change by Design Revised & Updated: How Design Thinking
3. Transforms Organizations and Inspires Innovation, Harper Business.(2019)
4. Namita Thapar(2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited

Online Learning Resources:

1. https://wadhwanifoundation.org/initiatives/entrepreneurship/

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Open Elective – II

S. No.	Course Name	Offering Department	Eligible Branches
1	Disaster Management	CE	All Branches
2	Sustainability In Engineering Practices	CE	All Branches
3	Renewable Energy Sources	EEE	All Branches Except EEE
4	Automation and Robotics	ME	All Branches Except ME
5	Product Lifecycle Management	ME	All Branches Except CE
6	Digital Electronics	ECE	All Branches Except ECE
7	Foundations of Operating Systems	CSE	CE, EEE, ME and ECE
8	Foundations of Machine Learning	CSE	CE, EEE and ECE
9	Web Technologies	CSE	CE, EEE, ME and ECE
10	Introduction to Information Systems	CSE	CE, EEE, ME and ECE
11	Optimization Techniques	HBS	All Branches Except ME
12	Physics of Electronic Materials and Devices	HBS	All Branches
13	Chemistry of Polymers and Applications		
14	Academic Writing and Public Speaking		
15	Mathematical Foundation of Quantum Technologies		

DISASTER MANAGEMENT (DM)

VI Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE601	OE-II	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Understand the definitions and terminologies used in disaster management.
CO2:	Understand the types and categories of disasters.
CO3:	Understand the impact of disasters on socio-economic and environment.
CO4:	Plan for disaster risk reduction, mitigation and management strategies.
CO5:	Understand the relationship between development and disasters.

UNIT – I

Introduction: Concepts and definitions: disaster, hazard, vulnerability, risks, severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT – II

Disasters: Disasters classification

Natural Disasters: Floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.

Manmade Disasters: Industrial pollution – Artificial flooding in urban areas –Nuclear radiation – Chemical spills – Transportation accidents – Terrorist strikes, etc. – Mountain and coastal areas.

UNIT – III

Disaster Impacts: Disaster impacts –Environmental, physical, social, ecological, economic, political, etc., Health - psycho-social issues – Demographic aspects – Hazard locations – Global and national disaster trends – Climate change and urban disasters.

UNIT – IV

Disaster Risk Reduction:

Disaster Management Cycle - its phases: Prevention, mitigation, preparedness, relief and recovery – Risk analysis, vulnerability and capacity assessment – Early warning systems.

Post-Disaster Environmental Response (i.e. water, sanitation, food safety, waste management, disease control, security, and communications): Role and responsibilities of government, community, local institutions, NGOs and other stakeholders – Policies and legislation for disaster risk reduction – Activities of National Disaster Management Authority.

UNIT – V

Disasters, Environment and Development: Factors affecting vulnerability such as impact of developmental projects and environmental modifications – Sustainable and environmental friendly recovery – Reconstruction and development methods.

Text Books:

3. PradeepSahni, Disaster Risk Reduction in South Asia, PHI, New Delhi.
4. Ghosh G.K., Disaster Management, APH Publishing Corporation.
5. Singh B.K., Handbook of Disaster Management Techniques &Guidelines, Rajat Publication.
6. V. K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, Delhi

Reference Books:

6. A Status Report Publication of the Govt. of India, Ministry of Home Affairs, National Disaster Management Division, Disaster Management in India.
7. A. S. Arya, Anup Karanth, and Ankush Agarwal, Hazards, Disasters and Your Community; A Primer for Parliamentarians, GOI–UNDP Disaster Risk Management Programme.
8. Interagency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

Online Learning Resources:

4. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
5. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
6. www.odihpn.org, Disaster Preparedness Programme in India. A Cost Benefit Analysis, Commissioned and Published by the Humanitarian Practice Network 'at ODI HPN.
7. www.empowerpoor.org, Drought in India: Challenges and Initiatives; Poorest Areas in Civil Society (PACS) Programme. [2001–2008]

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

SUSTAINABILITY IN ENGINEERING PRACTICES (SIE)								
VI Semester: All Branches						**Scheme:** 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OE602	**OE-II**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration:** 3 Hrs		

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

CO1:	Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
CO2:	Analyze sustainable construction materials, their durability, and lifecycle assessment.
CO3:	Apply Energy Calculations in construction materials and assess the embodied energy.
CO4:	Evaluate green building standards, energy codes, and performance ratings.
CO5:	Assess the environmental effects of energy use, climate change, and global warming.

UNIT – I

Introduction: Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO2Contribution From Cement and Other Construction Materials.

UNIT – II

Materials Used in Sustainable Construction: Construction Materials and Indoor Air Quality-No/Low Cement Concrete-Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

UNIT – III

Energy Calculations: Components of Embodied Energy-Calculation of Embodied Energy for Construction Materials-Energy Concept and Primary Energy-Embodied Energy Via-A-Vis Operational Energy in Conditioned Building -Lifecycle Energy Use.

UNIT – IV

Green Buildings: Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings - Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building.

UNIT – V

Environmental Effects: Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.

Text Books:

1. Charles J kibert Sustainable Construction: Green Building Design & Delivery,4th

Edition, Wiley Publisher 2016.

2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK,2016.

Reference Books:

1. Carig A.Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.

2. William P Spence, Construction Materials, Methods& Techniques (3e),Yesdee Publication Pvt. Ltd, 2012.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/105/105/105105157/

Question Paper Pattern:

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

RENEWABLE ENERGY SOURCES (RES)

VI Semester: All Branches Except EEE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE603	OE-II	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Understand principle operation of various renewable energy sources.
CO2:	Identify site selection of various renewable energy sources.
CO3:	Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomass, Tidal Wave and Fuel cell energies.
CO4:	Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems
CO5:	Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

UNIT – I

Solar Energy: Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT – II

PV Energy Systems: Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.

UNIT – III

Wind Energy: Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.

UNIT – IV

Geothermal Energy: Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT – V

Miscellaneous Energy Technologies:

Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations.

Biomass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration.

Fuel Cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Text Books:

1. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.
2. Chetan Singh Solanki "Solar Photo voltaics fundamentals, technologies and applications" 2nd Edition PHI Learning Private Limited. 2012.

Reference Books:

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. S. P. Sukhatme, "Solar Energy", 3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
3. B H Khan,"Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
4. S. Hasan Saeed and D.K.Sharma, "Non-Conventional Energy Resources", 3rd Edition, S.K.Kataria& Sons, 2012.
5. G. N. Tiwari and M.K.Ghosal, —Renewable Energy Resource: Basic Principles and Applications, Narosa Publishing House, 2004.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

Question Paper Pattern:

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

AUTOMATION AND ROBOTICS (ART)

VI Semester: All Branches except ME | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE604	OE-II	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understand the fundamentals of automation, manufacturing systems and automation hardware.
CO2:	Analyze automated flow lines and apply assembly line balancing methods.
CO3:	Classify robots, joints, actuators, and sensors used in robotic systems.
CO4:	Solve basic manipulator kinematics using transformation matrices.
CO5:	Explain the robot programming method and its applications.

UNIT – I

Introduction to Automation: Notion of Automation, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

UNIT – II

Automated Flow Lines: Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – III

Introduction to Robotics: Definition of Robot, Classification of Robot configurations, Types of Joints, degrees of freedom, End effectors, types of end effectors, Grippers-Mechanical grippers, Vacuum cups, magnetic grippers, Tools.

Robot Actuators and Feedback Components: Electrical Actuators (Variable Reluctance stepper motor, Permanent magnet stepper motor), Hydraulic and Pneumatic actuators. Position sensors–Potentiometer, Resolvers, Encoders. Velocity sensors, Tactile sensors, Proximity sensors.

UNIT – IV

Manipulator Kinematics: Introduction to manipulator kinematics, position representation, forward transformation and reverse transformation of two degree freedom robot arm, three degree of freedom arm in two dimensions, four degree freedom manipulators in three dimension, 3×3 Rotation matrix, Homogeneous transformation matrix and D – H notation matrix.

UNIT – V

Robot Programming: Methods of robot programming- Lead through- WAIT, SIGNAL and delay commands; The textual robot programming languages, robot language structures, constants, variables and other data objects, motion commands, end effectors, sensors

commands and monitor mode commands.

Robot Applications in Manufacturing: Material transfer and machine loading and unloading general considerations in material handling.

Processing Operations: Spot welding, continuous arc welding, spray coating, and other processing operations. Assembly and Inspection.

Text Books:

1. M P Groover, Automation , Production systems and Computer Integrated Manufacturing, Pearson Education, India
2. Mickel P Groover et. al, Industrial Robotics- Technology, Programming and Applications, McGraw Hill Publishers, New Delhi.
3. Deb S.R., Robotics Technology and Flexible Automation, TMH Publishers, New Delhi.

Reference Books:

1. Richard D. Klafter, Robotic Engineering: An Integrated Approach, Pearson Publications, New Jersy.
2. K. S. Fu, Ralph C. Gonzalez and C.S.G. Lee, Robotics, control, sensing, vision, Mc Graw Hill, New York.
3. Ashitava Ghosal, Robotics fundamental concepts and analysis, Oxford Higher Education, India

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

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PRODUCT LIFECYCLE MANAGEMENT (PLM)

VI Semester: All Branches Except CE | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE605	OE- II	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand Product life cycle management process.
CO2:	Understand different steps in Product development process.
CO3:	Get knowledge on Product data management
CO4:	Understand the implementation of PLM and its impact on the organization
CO5:	Understand core functions of PLM and supply chain and ERP systems

UNIT – I

Organization Business Models **(**MTS, MTO, CTO, ETO Etc), Basics of Enterprise Systems (PLM, ERP, MES), Background, Overview, Need, Benefits, and Concept of Product Life Cycle, Components / Elements of PLM, Emergence of PLM, Significance of PLM, Differences between PLM and PDM

UNIT – II

Integrated Product development process-Conceive-Specification, Concept design, Design-

Detailed design, Validation and analysis (Simulation), Tool design, Realize-Plan manufacturing, Manufacture, Build/Assemble, Test(quality check).

UNIT – III

Workflow Processes, Design Collaboration, Processes Management, Document Management, Visualization, Bill of Materials (BOM) Management – Lab exercises.

UNIT – IV

Engineering Change Control, Configuration Management, Manufacturing Process Management, Variant Management, Classification PLM Architecture, Various PLM tools, Data Modeling, Security management.

UNIT – V

CAD Integrations, Information authoring tools (e.g., MCAD, ECAD, Technical publishing), Core functions (e.g., data vaults), Data Flow to Other systems such as Supply chain and ERP systems. (4 hours for lab exercises)

Text Books:

1. Grieves, Michael, Product Lifecycle Management, McGraw-Hill publishers.
2. Antti Saaksvuori and Anselmi Immonen, Product Life Cycle Management, Springer publications

Reference Books:

1. Kari Ulrich and Steven D. Eppinger, Product Design & Development, McGraw Hill International
2. Burden, Rodger PDM: Product Data Management, Resource Publications.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

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DIGITAL ELECTRONICS (DE)

VI Semester: All Branches Except ECE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE606	OE-II	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

Course Outcomes : After the completion of the course students will be able to

CO1:	Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
CO2:	Analyze combinational circuits like adders, sub tractors, and code converters.
CO3:	Explore combinational logic circuits and their applications in digital design.
CO4:	Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
CO5:	Gain knowledge about programmable logic devices and digital IC's.

UNIT – I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR AND and NAND/NOR realizations.

UNIT – II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Grayto Binary, BCD to excess3, BCD to Seven Segment display.

UNIT – III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT – IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT – V

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL). Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

Text Books:

1. M Morris Mano and Michel D Ciletti, Digital Design, 5th Edition, Pearson Education, 1999
2. Zvi Kohavi and Nirah K Jha, Switching theory and Finite Automata Theory, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books:

1. Charles H Roth, Jr., Fundamentals of Logic Design, 5th Edition, Brooks/cole Cengage Learning, 2004.

Online Learning Resources:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. www.odihpn.org, Disaster Preparedness Programme in India. A Cost Benefit Analysis, Commissioned and Published by the Humanitarian Practice Network 'at ODI HPN.
4. www.empowerpoor.org, Drought in India: Challenges and Initiatives; Poorest Areas in Civil Society (PACS) Programme. [2001–2008]

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FOUNDATIONS OF OPERATING SYSTEMS (FOS)

VI Semester: CE, EEE, ME and ECE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE607	OE-II	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
CO2:	Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.
CO3:	Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
CO4:	Illustrate different conditions for deadlock and their possible solutions,memory management and its allocation policies.
CO5:	Design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms.

UNIT – I

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging.

UNIT – II

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication. Threads and Concurrency: Multithreading models, Thread libraries, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT – III

Synchronization Tools: The Critical Section Problem, Peterson‘s Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization. Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT – IV

Memory- Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Allocation of frames, Thrashing. Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT – V

File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory

implementation, Allocation method, Free space management; File-System Internals: File System Mounting, Partitions and Mounting, File Sharing. Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

Text Books:

1. Silber schatz A, Galvin P B, Gagne G, Operating System Concepts, 10th Edition, Wiley, 2018.
2. Tanenbaum A S, Modern Operating Systems, 4th Edition, Pearson , 2016

Reference Books:

1. Stallings W, Operating Systems -Internals and Design Principles, 9th edition, Pearson, 2018
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach, 3rd Edition, McGraw-Hill, 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106144/

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FOUNDATIONS OF MACHINE LEARNING (FML)

VI Semester: CE, EEE and ECE | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE608	OE-II	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Identify machine learning techniques suitable for a given problem.
CO2:	Solve the problems using various machine learning techniques.
CO3:	Design application using machine learning techniques.
CO4:	Understand and explore Supervised Learning techniques.
CO5:	Understand and explore unsupervised learning techniques.

UNIT – I

Introduction to Machine Learning & Preparing to Model: Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing.

UNIT – II

Modelling and Evaluation &Basics of Feature Engineering: Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection.

UNIT – III

Bayesian Concept Learning & Supervised Learning: Classification: Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network. Supervised Learning: Classification: Introduction, Example of Supervised Learning, Classification Model, Classification Learning Steps, Common Classification Algorithms-k-Nearest Neighbour(kNN), Decision tree, Random forest model, Support vector machines.

UNIT – IV

Supervised Learning: Regression: Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT – V

Unsupervised Learning: Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types

of clustering techniques, Partitioning methods, K- Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN Finding Pattern using Association Rule- Definition of common terms, Association rule, The apriori algorithm for association rule learning, Build the apriori principle rules.

Text Books:

1. Saikat Dutt, Subramanian Chandra mouli, Amit Kumar Das, Machine Learning, Pearson, 2019.

Reference Books:

1. Ethern Alpaydin, "Introduction to Machine Learning", MIT Press, 2004.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. Andreas C. Müller and Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Oreilly.

Online Learning Resources:

1. Andrew Ng, "Machine Learning B.Techning"
2. https://www.deeplearning.ai/machine-learning- B.Techning/
3. Shai Shalev-Shwartz , Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms" , Cambridge University Press.
4. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

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WEB TECHNOLOGIES (WT)

VI Semester: CE, EEE, ME and ECE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE609	OE-II	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course, students will be able to	
CO1:	Design a Web Page using Text Formatting Tags, Hyperlinks.
CO2:	Develop a webpage with Images, Tables Hyperlinks, Lists, and CSS.
CO3:	Design dynamic web pages using JavaScript.
CO4:	Design a Form using HTML Forms & Controls.
CO5:	Understand the basic concepts of PHP and database connection using XAMPP Server.

UNIT – I

HTML5: Overview of HTML5 and other web technologies, HTML5 and its essentials, Fundamentals of HTML5,Working with Text and organizing Text in HTML, Working with Links and URLs.

UNIT – II

Images: Working with Images, Image Maps, Creating Tables, Frames CSS: Overview of CSS, Backgrounds and Color Gradients in CSS, Fonts and Text Styles, List Styles, Table Layouts

UNIT – III

JavaScript: Overview of java script, Functions, Events, Java script Objects, Working with Browser Objects, Document Object, Document Object Model, Validation, Errors, and Exception Handling in JavaScript.

UNIT – IV

Forms: What's a Form? What Controls are available? Creating a Form and adding HTML Controls, Submitting Data from forms, Customizing Controls in CSS, Form validation using Java Script, Interactive Elements.

UNIT – V

Introduction to PHP: Installing and Configuring PHP: Building PHP with Apache on Windows, The Basics of PHP scripts. The Building blocks of PHP: Variables, Data Types, Operators and Expressions, Constants. Creating Forms, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, XAMPP Server configuration.

Text Books:

1. HTML5 Black Book, 2nd Edition, Dreamtech Press, 2016
2. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, Prentice Hall, 5th Edition, 2011.
3. Julie C. Meloni, PHP MySQL and Apache, SAMS Teach yourself, Pearson Education (2007).

Reference Books:

1. Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.

2. Robert Pattinson, Beginners Guide for HTML and CSS Web Design and Web Development,2018.

3. Jeffrey C and Jackson, —Web Technologies A Computer Science PerspectivePearsonEducation, 2011.

4. Gopalan N.P. and Akilandeswari J., —Web Technology, Prentice Hall of India, 2011.

Online Learning Resources:

1. https://www.tutorialspoint.com/Html/index.htm
2. https://www.w3.org/Style/CSS/
3. https://www.w3schools.com/php/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

INTRODUCTION TO INFORMATION SYSTEMS (IIS)

VI Semester: CE, EEE, ME and ECE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE610	OE-II	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Understand the concepts of Computer architecture and functionalities of System Software.
CO2:	Understand the page replacement and CPU Scheduling Algorithms
CO3:	Understand the phases of software development life cycle and process models.
CO4:	Design ER model for real life scenarios
CO5:	Apply SQL commands to create, update, modify, retrieve and normalization on the databases.

UNIT – I

Fundamentals of Computers & Computer Architecture: Introduction, Organization of a small computer, Central Processing Unit, Execution cycle, Instruction categories, measure of CPU performance, Memory, Input/output devices, BUS, addressing modes

System Software: Assemblers, Loaders and linkers, Compilers and interpreters.

UNIT – II

Operating System: Introduction, Memory management schemes, Page replacement algorithms, Process management, CPU scheduling algorithms.

Software engineering: Software engineering: Introduction to Software engineering, Life cycle of a software project, software Development models.

UNIT – III

Relational Database Management System: Introduction to DBMS, the database technology, data models, Database Users.

Entity Relationship (E-R) Modeling: Introduction, Notations, Modeling E-R Diagrams, Case Studies, Merits and Demerits of E-R modeling.

UNIT – IV

Structured Query Language (SQL): Introduction to SQL, Data types, Data Definition language commands, Data Manipulation Language Commands and Data control Language Commands, Candidate Key, Primary key, Foreign key, Select Clause, Where Clause, Logical Connectives – AND, OR, Range Search, Pattern Matching, Order By, Group By, Set Operations – Union, Intersect and Minus, Aggregate Functions, Join Operations

UNIT – V

Normalization: Introduction, Need for Normalization, Process of Normalization, Types of Normal Forms (1NF, 2 NF,3 NF & BCNF), Merits and Demerits of Normalization.

Text Books:

1. Campus Connect Foundation Program – Computer Hardware and System Software Concepts, Programming Fundamentals- Vol. – 1, INFOSYS

2. Campus Connect Foundation Program – Relational Database Management System, Client Server Concepts, Introduction to Web Technologies - Vol. – 4, INFOSYS

3. Henry F. Korth& Abraham Silberschatz, - Data Base System Concepts, 5th Edition, 2005, Mc Graw hill

Reference Books:

1. M. Morris Mano [2011], [3 rd Edition], Computer system architecture, Pearson Education, 2011

2. Sommerville [2008], [7th Edition], Software Engineering, Pearson education.

3. Raghu Ramakrishna and Johannes Gehrke [2003], [3rd Edition], Data Base Management Systems, TATA McGraw Hill

4. Tanenbaum [2000], Modern Operating System, Pearson Education

Online Learning Resources:

1. https://www.w3schools.com/sql/
2. https://www.geeksforgeeks.org/dbms/
3. https://www.tutorialride.com/software-engineering/software-engineering-tutorial.htm

Question Paper Pattern:

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

OPTIMIZATION TECHNIQUES (OT)

VI Semester: All Branches Except ME						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE611	OE-II	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.
CO2:	Interpret the transportation models' solutions and infer solutions to the real-world problems.
CO3:	Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.
CO4:	Apply the concept of non-linear programming for solving the problems involving non linear constraints and objectives
CO5:	Apply the concept of unconstrained geometric programming for solving the problems L2, L3 involving non-linear constraints and objectives.

UNIT – I

Linear programming I: Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method.

UNIT – II

Linear programming II: Duality in Linear Programming

Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

UNIT – III

Non-linear programming: Unconstrained Optimization Techniques

Introduction: Classification of Unconstrained minimization methods,

Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

UNIT – IV

Non-linear programming: **Constrained Optimization Techniques**

Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

UNIT – V

Geometric Programming :

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

Constrained minimization Problems: Solution of a constrained geometric programming

problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

Text Books:

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

Reference Books:

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

PHYSICS OF ELECTRONIC MATERIALS AND DEVICES (PEMD)

VI Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE612	OE-II	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand crystal growth and thin film preparation
CO2:	Summarize the basic concepts of semi conductors
CO3:	Illustrate the working of various semi conductor devices
CO4:	Analyze various luminescent phenomena and the devices based on the concepts
CO5:	Explain the working of different display devices

UNIT – I

Fundamentals of Materials Science: Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge.

UNIT – II

Semiconductors: Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT – III

Physics of Semiconductor Devices: Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Hetero junctions, Transistors, MOSFETs.

UNIT – IV

Excitons and Luminescence:

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials.

Photo luminescence: General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot.

Electro-luminescence: General Principles of electroluminescence, light emitting diode, diode laser.

UNIT – V

Display devices: LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

Text Books:

1. S O Kasap, Principles of Electronic Materials and Devices, McGraw-Hill Education(India)Pvt.Ltd.,4th edition,2021.

2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.

Reference Books:

1. B G Streetman and S Banerjee, Solid State Electronic Devices, PHI Learning,6th edition

2. Eugene A Irene, Wiley, Electronic Materials Science,2005

3. Grover and Jamwal, DhanpatRai and Co., Electronic Components and Materials, New Delhi., 2012.

4. Wei Gao, Zhengwei Li, Nigel Sammes, An Introduction to Electronic Materials for Engineer, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011

Online Learning Resources:

1. https://nptel.ac.in/courses/113/106/113106062/https://onlinecourses.nptel.ac.in/noc20_ph24/preview

Question Paper Pattern:

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

CHEMISTRY OF POLYMERS AND APPLICATION (CPA)

VI Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE613	OE-II	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Classify the polymers, explain polymerization mechanism, differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer
CO2:	Describe the physical and chemical properties of natural polymers and Modified cellulosics.
CO3:	Differentiate Bulk, solution, suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers.
CO4:	Identify types of polymer networks, describe methods involve in hydrogel reparation, Explain applications of hydrogels in drug delivery
CO5:	Explain classification and mechanism of conducting and degradable polymers

UNIT – I

Polymers-Basics and Characterization: Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers,

Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

UNIT – II

Natural Polymers & Modified Cellulosics: Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified Cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

UNIT – III

Synthetic Polymers: Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.

UNIT – IV

Hydrogels of Polymer Networks: Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

UNIT – V

Conducting and Degradable Polymers:

Conducting Polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

Degradable Polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

Text Books:

1. Billmayer, A Text book of Polymer science
2. G.S.Mishra, Polymer Chemistry
3. Gowarikar, Polymer Chemistry

Reference Books:

1. K J Saunders, Chapman and Hall, Organic polymer Chemistry
2. B Miller, Prentice Hall, Advanced Organic Chemistry
3. Premamoy Ghosh, Polymer Science and Technology, 3rd edition, McGraw-Hill, 2010.

Question Paper Pattern:

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ACADEMIC WRITING AND PUBLIC SPEAKING (AWPS)

VI Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE614	OE-II	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Understand various elements of Academic Writing
CO2:	Identify sources and avoid plagiarism
CO3:	Demonstrate the knowledge in writing a Research paper
CO4:	Analyse different types of essays
CO5:	Assess the speeches of others and know the positive strengths of speakers
CO6:	Build confidence in giving an impactful presentation to the audience

UNIT – I

Introduction to Academic Writing:

Academic Writing: Introduction

Essential Features of Academic Writing: Courtesy, Clarity, Conciseness, Correctness, Coherence, Completeness

Types of Academic Writing: Descriptive, Analytical, Persuasive, Critical writing

UNIT – II

Academic Journal Article:

Art of condensation: summarizing and paraphrasing

Abstract Writing

Writing: Project Proposal, an application for internship, Technical/Research/Journal Paper Writing, Conference Paper Writing

Editing and Proofreading

Understanding and avoiding Plagiarism

UNIT – III

Essay Writing & Writing Reviews:

Types of Essays: Compare and Contrast Essay, Argumentative Essay, Exploratory Essay

Features and analysis of sample essays

Writing a Book Report

Summarizing

Writing a Book/Film Review

Writing a Statement of Purpose (SoP)

UNIT – IV

Public Speaking:

Public Speaking: Introduction, Nature, characteristics, and significance

Presentation skills: 4 P's of Presentation, Stage Dynamics, Answering Strategies during presentations

Analysis of impactful speeches

Types of speeches for academic events

UNIT – V

Public Speaking and Non-Verbal Delivery: Body Language, Facial Expressions, Kinesics, Oculesics, Proxemics, Haptics, Chronomics, Paralanguage, Signs

Text Books:

1. Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)
2. Pease, Allan & Barbara. The Definitive Book of Body LanguageRHUS Publishers, 2016

Reference Books:

1. Alice Savage, Masoud Shafiei Effective Academic Writing,2Ed.,2014 Oxford University Press.
2. Shalini Verma, Body Language, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata, Communication Skills 2E 2015, Oxford.
4. Sharon Gerson, Steven Gerson, Technical Communication Process and Product, Pearson, New Delhi, 2014
5. Elbow, Peter. Writing with Power. OUP USA, 1998

Online Learning Resources:

1. https://youtu.be/NNhTIT81nH8
2. phttps://www.youtube.com/watch?v=478ccrWKY-A
3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4
5. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12 nonverbal-aspects-of delivery/
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
7. https://archive.nptel.ac.in/courses/109/107/109107172/#
8. https://archive.nptel.ac.in/courses/109/104/109104107/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

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MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES (MFQT)

VI Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE615	OE-II	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand the Transformation theory and Hilbert space
CO2:	Analyze the properties and operators of Hilbert space and apply Eigen values to it.
CO3:	Apply statistics to measure theory, uncertainty relations and radiation theory.
CO4:	Evaluate problems on reversibility, equilibrium and macroscopic measurements.
CO5:	Formulate problems of composite system and measuring process

UNIT – I

Introductory Considerations: The origin of the Transformation Theory, The Original Formulation of Quantum Mechanics, The Equivalence of the two Theories: (i) The Transformation Theory, (ii) Hilbert Space.

UNIT – II

Abstract Hilbert Space: The definition of Hilbert space, The Geometry of Hilbert space, Degression on the Conditions A-E, Closed linear Manifolds, Operators in Hilbert space, The Eigen Value Problem, Continuation, Initial Consideration concerning the Eigenvalue Problem, Degression on the Existence and Uniqueness of solutions of the Eigenvalue Problems, Cumulative operators, The Trace.

UNIT – III

The Quantum Statistics: The statistical assertions of quantum mechanics, the statistical interpretation, Simultaneous Measurability and Measurability in General, Uncertainty Relations, Projections as Propositions, Radiation Theory.

UNIT – IV

Deductive Development of the Theory and General Considerations: The fundamental basis of the statistical theory, Conclusions from Experiments. Measurement and reversibility, Thermodynamics Considerations, Reversibility and equilibrium problems, The Macroscopic Measurement.

UNIT – V

The Measuring Process: Formulation of the problems, Composite systems, discussion of the Measuring process.

Text Books:

1. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics, Princeton Univ. Press (1996).
2. M D Srinivas, Measurements and Quantum Probabilities, University Press, Hyderabad.

Reference Books:

1. Leonard Schiff, Quantum Mechanics, Mc, Graw Hill (Education) (2010)

2. Parthasarathy. K. R., Mathematical Foundations of Quantum, Hindustan Book Agency, New Delhi.

3. Gerad Tesch, Mathematical Methods in Quantum Mechanics with application to Schrodinger. operators, Graduate Studies in Mathematics, 99, AMS, Providence, 2009

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

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Open Elective – III

S.No.	Course Name	Offering Department	Eligible Branches
1	Building Materials and Services	CE	All Branches Except CE
2	Environmental Impact Assessment	CE	All Branches
3	Smart Grid Technologies	EEE	All Branches Except EEE
4	3D Printing Technologies	ME	All Branches Except ME
5	Composite Materials	ME	All Branches
6	Applications of Microprocessors and Microcontrollers	ECE	All Branches Except EEE and ECE
7	Introduction to Database Systems	CSE	CE, EEE, ME and ECE
8	Cyber Security	CSE	CE, EEE, ME and ECE
9	Modern C++	CSE	All Branches
10	Wavelet Transforms and its Applications	HBS	All Branches
11	Smart Materials and Devices		
12	Green Chemistry and Catalysis for Sustainable Environment		
13	Employability Skills		
14	Introduction to Quantum Mechanics		

BUILDING MATERIALS AND SERVICES (BMS)

VII Semester: All Branches Except CE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE701	OE-III	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course, students will be able to	
CO1:	Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, and plastics
CO2:	Analyze the composition, manufacturing process, and properties of cement and admixtures.
CO3:	Apply knowledge of building components such as lintels, arches, stairs, floors, roofs, foundations
CO4:	Evaluate masonry, mortars, finishing techniques ,and form work systems
CO5:	Assess various building services including plumbing, ventilation, acoustics, and fire protection.

UNIT – I

Building Materials:

Building Stones: Classifications– Properties – Structural Requirements.

Bricks: Composition of Brick Earth – Qualities of good brick – Types of brick.

Tiles: Characteristics of good tile– Types of tiles.

Wood: Structure – Types and Properties – Seasoning.

Other Materials: Properties and uses of Steel, Aluminum and Plastics.

UNIT – II

Cement & Admixtures: Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency– Initial &Final Setting – Soundness. Admixtures – Mineral & Chemical Admixtures – Uses

UNIT – III

Building Components:

Foundations: Types.

Floors: Types of Floors.

Roofs: Flat, Curved, Trussed.

Stair Cases – terminology: Types.

Lintels and Arches.

UNIT – IV

Mortars: Lime and Cement Mortars

Masonry: Bonds in Brick Masonry and Stone Masonry

Finishers: Plastering, Pointing, Painting.

Form Work: Types, Requirements – Scaffolding.

UNIT – V

Building Services:

Plumbing Services: Water Distribution, Sanitary – Lines &Fittings;

Ventilations: Functional Requirements – Natural and Mechanical ventilation

Acoustics: Characteristic – Absorption – Acoustic Design.

Fire Protection: Fire Hazards – Classification of Fire Resistant Materials and Constructions.

Text Books:

7. Building Materials and Construction–Arora & Bindra, Dhanpat Roy Publications
8. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt. Ltd., 2015

Reference Books:

1. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delh
2. P.C.Varghese, Building Materials, Prentice Hall of India, 2015.
3. N.Subramanian, Building Materials Testing and Sustainability, Oxford Higher Education, 2019.
4. R. Chudley, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

Online Learning Resources:

8. https://archive.nptel.ac.in/courses/105/102/105102088/

Question Paper Pattern:

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ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

VII Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE702	OE-III	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Apply various methodologies for conducting Environmental Impact Assessments
CO2:	Analyze the impact of land-use changes on soil, water, and air quality.
CO3:	Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
CO4:	Develop environmental audit reports and assess compliance with environmental policies.
CO5:	Interpret and apply environmental acts and regulations related to EIA.

UNIT – I

Concepts and methodologies of EIA: Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

UNIT – II

Impact of Developmental Activities and Land Use: Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I A in Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts on Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

UNIT – III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment: Introduction - Assessment of Impact of Development Activities On Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing An Environmental Risk Assessment-Advantages of Environmental Risk Assessment.

UNIT – IV

Environmental Audit: Introduction - Environmental Audit & Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report

UNIT – V

Environmental Acts and Notifications: The Environmental Protection Act, The Water Preservation Act, The Air(Prevention &Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000.

Text Books:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

Reference Books:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/124/107/124107160/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

SMART GRID TECHNOLOGIES (SGT)

VII Semester: All Branches Except EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE703	OE-III	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understanding the Concept and Evolution of Smart Grids.
CO2:	Analyzing Wide Area Monitoring System and Synchrophasor Technology.
CO3:	Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts.
CO4:	Evaluating Information and Communication Technology (ICT) Systems in Smart Grids.
CO5:	Designing Smart Grid Applications and Cybersecurity Measures.

UNIT – I

Introduction to Smart Grid: Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture.

UNIT – II

Wide Area Monitoring System: Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchrophasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.

UNIT – III

Smart Meters: Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management.

UNIT – IV

Information and Communication Technology: Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid.

UNIT – V

Smart Grid Applications and Cyber Security: Applications: Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model.

Text Books:

1. James Momoh, "SMART GRID: Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012.

Reference Books:

1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.
2. Fereidoon. P. Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.
3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.
4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.

Online Learning Resources:

1. https://nptel.ac.in/courses/108107113

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

3D PRINTING TECHNOLOGIES (3DPT)

VII Semester: All Branches Except ME					Scheme: 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE704	OE–III	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1:	Explain the fundamentals of AM, its process steps, classification, materials, and describe Vat Photo-polymerization methods with applications.
CO2:	Explain Material Jetting, Binder Jetting, and FDM processes in terms of materials, working principles, benefits, and illustrate their applications.
CO3:	Explain the working of Sheet Lamination, 3DP, and Powder Bed Fusion processes, and analyze their advantages and industrial use cases.
CO4:	Describe Directed Energy Deposition AM processes, benefits, and applications.
CO5:	Explain post-processing techniques in AM and understand the concepts of direct and indirect rapid tooling methods with examples.

UNIT – I

Introduction to Additive Manufacturing: Introduction to AM, AM evolution, Distinction between AM & CNC machining, Steps in AM, Classification of AM processes, Advantages of AM and Types of materials for AM.

Vat Photo-polymerization AM Processes: Stereolithography (SL), Materials, Process Modeling, SL resin curing process, SL scan patterns, Micro-Stereolithography, Mask Projection Processes, Process Benefits and Drawbacks, Applications of Vat Photo-polymerization, case studies**.**

UNIT – II

Material Jetting AM Processes: Evolution of Printing as an Additive Manufacturing Process, Materials, Process Benefits and Drawbacks, Applications of Material Jetting Processes.

Binder Jetting AM Processes: Materials, Process Benefits and Drawbacks, Research achievements in printing deposition, Technical challenges in printing, Applications of Binder Jetting Processes.

Extrusion-Based AM Processes: Fused Deposition Modelling (FDM), Principles, Materials, Process Modelling, Plotting and path control, Bio-Extrusion, Contour Crafting, Process Benefits and Drawbacks, Applications of Extrusion-Based Processes, case studies.

UNIT – III

Sheet Lamination AM Processes: Bonding Mechanisms, Materials, Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC), Gluing, Thermal bonding, LOM and UC applications, case studies.

Three Dimensional Printing (3DP): Principle, Process, Applications, advantages and disadvantages of 3DP.

Powder Bed Fusion AM Processes: Selective laser Sintering (SLS), Materials, Powder fusion mechanism and powder handling, Process Modelling, SLS Metal and ceramic part creation,

Electron Beam melting (EBM), Process Benefits and Drawbacks, Applications of Powder Bed Fusion Processes, case studies.

UNIT – IV

Directed Energy Deposition AM Processes: Process Description, Material Delivery, Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Benefits and drawbacks, Applications of Directed Energy Deposition Processes.

UNIT – V

Post Processing of AM Parts: Support Material Removal, Surface Texture Improvement, Accuracy Improvement, Aesthetic Improvement, Property Enhancements using Non-thermal and Thermal Techniques.

Rapid Tooling: Direct and Indirect methods AIM tooling, SLS rapid steel, Direct Laser Metal Sintering (DMLS), Laminate tooling. RTV silicon rubber moulds, Vacuum casting, Reaction injection Moulding (RIM),Wax Injection moulding, Spray metal tooling, 3D kelt tool

Text Books:

1. Chua C.K., Leong.K.F, and Lim C, C.S., Rapid Prototyping Principles and Applications, World Scientific Publishing Co. Pte. Ltd
2. D.T.Pham and S.S.Dimov, Rapid manufacturing The technologies and applications of rapid Prototyping and rapid tooling. Springer Publications

Reference Books:

1. Terry Wholers, Wholers report, Wholers Associates
2. Gibson D. W. Rosen and B. Stucker., Additive manufacturing technologies, Springer Publication

Online Resources:

1. https://www.nist.gov/additive-manufacturing
2. https://www.metal-am.com/
3. http://additivemanufacturing.com/basics/
4. https://www.3dprintingindustry.com/
5. https://www.thingiverse.com/
6. https://reprap.org/wiki/RepRap

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

COMPOSITE MATERIALS (CM)

VII Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE705	OE-III	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Identify the properties of fiber and matrix materials used in commercial composites.
CO2:	Describe the manufacture of polymer matrix composites.
CO3:	Compare and evaluate the metal manufacturing methods.
CO4:	Analyze the Hooke's law for different type of materials.
CO5:	Examine the elastic behaviour of the unidirectional composite.

UNIT – I

Basic Concepts and Characteristics: Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites.

Reinforcements: Fibers- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibers. Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites

UNIT – II

Manufacturing of Polymer Composites: Autoclave, tape production, moulding methods, filament winding, hand layup, pultrusion, Resin Transfer Moulding, injection moulding, compression moulding Properties and applications.

UNIT – III

Manufacturing of Metal Matrix Composites: Stir Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications.

Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering.

Manufacturing of Carbon – Carbon Composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT – IV

Coordinate Transformations: Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation.

UNIT – V

Elastic Behaviour of Unidirectional Composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

Text Books:
1. R M Jones, Mechanics of Composite Materials Mc Graw Hill Company, New York.
2. Isaac and M.Daniel, Engineering Mechanics of Composite Materials, Oxford University Press, New York
Reference Books:
1. Madhujit Mukhopadadhyay, Mechanics of composite materials and structures, Universities Press, Hyderabad
2. L. R. Calcote, Analysis of Laminated Composite Structures ,Van Nostrand Rainfold, US
3. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley Interscience, New York
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions. **End Examination:** The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

APPLICATIONS OF MICROPROCESSORS AND MICROCONTROLLERS (AMMC)

VII Semester: All Branches Except EEE and ECE | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE706	OE-III	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Analyze the architectural concepts of 8086 microprocessor.
CO2:	Apply the programming model of 8086 in assembly language programming.
CO3:	Analyze the multiple concepts of 8086 interfacing.
CO4:	Analyze the architectural concepts the 8051 microcontroller.
CO5:	Apply the programming model of 8051 in interfacing with peripherals.

UNIT – I

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT – II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT – III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT – IV

8051 Microcontroller: Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT – V

Interfacing Microcontroller: Programming 8051 Instruction set - Addressing modes Programming Switches, LEDs, Displays – Seven Segment, LCD, Sensors, Stepper Motor and Waveform generation- Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Text Books:

1. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
2. Mazidi Muhammad Ali, Mazidi Janice Gillespie & Mc KinlayRolin D, The 8051Microcontroller and Embedded Systems, 2nd Edition, Pearson Education,

2008.

3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

Reference Books:

1. John Uffenbeck, The 8086/8088 Family: Design, Programming, and Interfacing, 3rd Edition, Pearson Ed, 2006.

2. Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publication Ltd, 2006.

Online Learning Resources:

1. www.nptel.onlinecourseac.in/.microprocessorsandmicrocontrollers

2. https://onlinecourses.nptel.ac.in/noc18_ec03/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

INTRODUCTION TO DATABASE SYSTEMS (IDS)

VII Semester: CE, EEE, ME and ECE						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE707	OE-III	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Understand the basic concepts of database management systems
CO2:	Analyze a given database application scenario to use ER model for conceptual design of the database
CO3:	Utilize SQL proficiently to address diverse query challenges.
CO4:	Employ normalization methods to enhance database structure.
CO5:	Assess and implement transaction processing, concurrency control and database recovery protocols in databases.

UNIT – I

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT – II

Entity Relationship Model: Introduction, the building blocks of an entity relationship diagram, classification of entity sets, attribute classification, relationship degree, relationship classification, reducing ER diagram to tables, enhanced entity-relationship model (EER model), generalization and specialization, IS A relationship and attribute inheritance, multiple inheritance, constraints on specialization and generalization, advantages of ER modelling.

UNIT – III

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF)

UNIT – IV

Structured Query Language: Introduction, History of SQL Standard, Commands in SQL, Data Types in SQL, Data Definition Language, Selection Operation, Projection Operation, Aggregate functions, Data Manipulation Language, Table Modification Commands, Join Operation, Set Operations, View, Sub Query.

UNIT – V

PL/SQL: Introduction, Shortcomings of SQL, Structure of PL/SQL, PL/SQL Language Elements, Data Types, Operators Precedence, Control Structure, Steps to Create a PL/SQL,

Program, Iterative Control, Procedure, Function, Database Triggers, Types of Triggers.

Text Books:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,
3. SQL: The Ultimate Beginners Guide by Steve Tale

Reference Books:

1. Introduction to Database Systems, 8thedition, C J Date, Pearson
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282 02 2456_shared/overview
3. Oracle SQL Developer - Full Course
4. https://www.youtube.com/watch?v=9ic3KEH4Ah4

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

CYBER SECURITY (CS)

VII Semester: CE, EEE, ME and ECE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE708	OE-III	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Classify the cybercrimes and understand the Indian ITA 2000.
CO2:	Analyse the vulnerabilities in any computing system and find the solutions.
CO3:	Predict the security threats of the future.
CO4:	Investigate the protection mechanisms.
CO5:	Design security solutions for organizations

UNIT – I

Introduction to Cyber crime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The Legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT – II

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT – III

Cyber crime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones.

UNIT – IV

Tools and Methods Used in Cyber crime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT – V

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC

Press.

2. Introduction to Cyber Security , Chwan –Hwa (john) Wu ,J. DavidIrwin.CRC Press T&F Group

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. https://www.udemy.com/course/cybersecurity-from-beginner-to-expert

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

MODERN C++ (MC)

VII Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE709	OE-III	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Distinguish the procedural and object oriented paradigm along with principles
CO2:	Understand dynamic memory management techniques using pointers, constructors, destructors
CO3:	Understand the concept of function overloading, operator overloading, virtual functions and polymorphism.
CO4:	Classify inheritance with the understanding of early and late binding.
CO5:	Illustrate the process of data file manipulations using C++.
CO6:	Analyze an ability to incorporate Exception handling in Object Oriented program.

UNIT – I

Object-Oriented Thinking: Different paradigms for problem solving, need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts Abstraction, Encapsulation, Inheritance and Polymorphism

C++ Basics: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, go to statements. Functions - Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions

UNIT – II

C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

UNIT – III

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

UNIT – IV

Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

UNIT – V

C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Overloading operators, Error handling during file operations, Formatted I/O

Exception Handling:

Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception objects, Exception specifications.

Text Books:

1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill.
2. Problem solving with C++: The Object of Programming, 4th Edition, Walter Savitch, Pearson Education.

Reference Books:

1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education
2. OOP in C++, 3rd Edition, T. Gaddis, J. Walters and G. Muganda, Wiley Dream Tech Press
3. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd

Online Learning Resources:

1. https://nptel.ac.in/courses/106105234
2. https://www.geeksforgeeks.org/cpp/c-plus-plus/
3. https://www.tutorialspoint.com/cplusplus/index.htm

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

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WAVELET TRANSFORMS AND ITS APPLICATIONS (WTA)

VII Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE710	OE-III	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms.
CO2:	Illustrate the multi resolution analysis ad scaling functions.
CO3:	Implement discrete wavelet transforms with multirate digital filters.
CO4:	Understand multi resolution analysis and identify various wavelets and evaluate their time- frequency resolution properties.
CO5:	Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields.

UNIT – I

Wavelets: Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete Time and Continuous Wavelet Transforms.

UNIT – II

A Multi resolution Formulation of Wavelet Systems: Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT – III

Filter Banks and the Discrete Wavelet Transform: Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating - Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - - Different Points of View.

UNIT – IV

Time-Frequency and Complexity: Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform-Numerical Complexity of the Discrete Wavelet Transform.

UNIT – V

Bases and Matrix Examples: Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

Text Books:

1. C. Sidney Burrus, Ramesh A. Gopinath, ―Introduction to Wavelets and Wavelets Transforms‖, Prentice Hall, (1997).

2. James S. Walker, ―A Primer on Wavelets and their Scientific Applications‖, CRC Press, (1999).

Reference Books:

1. Raghuveer Rao, ―"Wavelet Transforms", Pearson Education, Asia

2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

SMART MATERIALS AND DEVICES (SMD)

VII Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE711	OE-III	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Provide exposure to smart materials and their engineering applications.
CO2:	Impart knowledge on the basics and phenomenon behind the working of smart materials
CO3:	Explain the properties exhibited by smart materials.
CO4:	Educate various techniques used to synthesize and characterize smart materials
CO5:	Identify the required smart material for distinct applications/devices

UNIT – I

Introduction to Smart Materials: Historical account of the discovery and development of smart materials, Shape memory materials, chromo active materials, magnet orheological materials, photoactive materials, Polymers and polymer composites (Basics).

UNIT – II

Properties of Smart Materials: Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT – III

Synthesis of Smart Materials: Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

UNIT – IV

Characterization Techniques: Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

UNIT – V

Smart Materials Based Devices: Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

Text Books:

1. Yaser Dahman, Nanotechnology and Functional Materials for Engineers-,Elsevier, 2017
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

Reference Books:

1. P Gauenzi, Smart Structures, Wiley, 2009.
2. Mahmood Ali of khazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014
3. Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0,

Chaudhery Mustansar Hussain, Paolo Di Sia, Springer,2022.

4. Fundamentals of Smart Materials, Mohsen Shahinpoor, Royal Society of Chemistry, 2020

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (GCSE)								
VII Semester: All Branches						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OE712	**OE-III**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course, students will be able to	
CO1:	Understand principle and concepts of green chemistry.
CO2:	Understand the types of catalysis and industrial applications.
CO3:	Apply green solvents in chemical synthesis.
CO4:	Enumerate different sourced of green energy.
CO5:	Apply alternative greener methods foe chemical reactions.

UNIT – I

Principles And Concepts of Green Chemistry: Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un- economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

UNIT – II

Catalysis And Green Chemistry: Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio- catalysis and Photo-catalysis with examples.

UNIT – III

Green Solvents In Chemical Synthesis: Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbondioxide, super critical water, Polyethyleneglycol (PEG), Ionic liquids, Recyling of green solvents.

UNIT – IV

Emerging Greener Technologies: Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock‘s, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Bio refinery, Design for energy efficiency, Mechanochemical synthesis.

UNIT – V

Alternative Greener Methods: Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

Text Books:

1. M. Lancaster,Green Chemistry an introductory text, Royal Society of Chemistry, 2002.

2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

Reference Books:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.

2. AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2013.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

EMPLOYABILITY SKILLS (ESK)

VII Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE713	OE-III	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand the importance of goals and try to achieve them.
CO2:	Explain the significance of self-management.
CO3:	Apply the knowledge of writing skills in preparing eye-catchy resumes.
CO4:	Analyse various forms of Presentation skills.
CO5:	Judge the group behaviour appropriately.
CO6:	Develop skills required for employability

UNIT – I

Goal Setting and Self-Management: Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis

UNIT – II

Writing Skills: Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)

UNIT – III

Technical Presentation Skills: Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation

UNIT – IV

Group Presentation Skills: Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion-Debate –Corporate Etiquette

UNIT – V

Job Cracking Skills: Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

Text Books:

1. Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills,2014.Cambridge Publisher
2. Alka Wadkar. Life Skills for Success, Sage Publications, 2016.

Reference Books:

1. Gangadhar Joshi. Campus to Corporate Paperback , Sage Publications. 2015
2. Sherfield Montogomery Moody,Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008

3. Sherfield Montogomery Moody,Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008

4. M. Sen Gupta, Skills for Employability, Innovative Publication, 2019.

5. Steve Duck and David T McMahan, The Basics f Communication Skills A Relational Perspective, Sage press, 2012

Online Learning Resources:

1. https://youtu.be/gkLsn4ddmTs
2. https://youtu.be/2bf9K2rRWwo
3. https://youtu.be/FchfE3c2jzc
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
5. https://www.youtube.com/c/skillopedia/videos
6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview
7. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
8. https://archive.nptel.ac.in/courses/109/107/109107172/#
9. https://archive.nptel.ac.in/courses/109/104/109104107/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

INTRODUCTION TO QUANTUM MECHANICS (IQM)

VII Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE714	OE-III	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Explain the key principles of quantum mechanics and wave-particle duality
CO2:	Apply Schrödinger equations to solve one-dimensional quantum problems
CO3:	Solve quantum mechanical problems using operator and matrix methods.
CO4:	Evaluate quantum states using Dirac notation and expectation values.
CO5:	Analyze angular momentum and spin systems using Pauli matrices and operators.

UNIT – I

Principles of Quantum Mechanics: Introduction, Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation. Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle. Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions

UNIT – II

One Dimensional Problems and Solutions: Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

UNIT – III

Operator Formalism: Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

UNIT – IV

Mathematical Tools for Quantum Mechanics: The concept of row and column matrices, Matrix algebra, Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

UNIT – V

Angular Momentum and Spin: Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half (1/2), Spin angular momentum, Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.

Text Books:

1. Quantum Mechanics. Vol 1, A. MessaiaNoth-Holland Pub. Co., Amsterdam, 1961.

2. A Text Book of Quantum Mechanics. P.M.Mathews and K.Venkatesam, Tata McGraw Hill, New Delhi.

3. Introduction to Quantum Mechanics. R.H.Dicke and J.P.Witke, Addison-Wisley Pub. Co. Inc., London, (1960).

4. Quantum Mechanics. S L Gupta, V Kumar, H V Sarama and R C Sharma, Jai Prakash Nath & Co, Meerut, (1996).

Reference Books:

1. Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).

2. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.), 2003.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/115/101/115101107/
2. https://archive.nptel.ac.in/courses/122/106/122106034/
3. https://nptel.ac.in/courses/115106066

Question Paper Pattern:

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

Open Elective – IV

S.No.	Course Name	Offering Department	Eligible Branches
1	Geo-Spatial Technologies	CE	All Branches Except CE
2	Solid Waste Management	CE	All Branches
3	Electric Vehicles	EEE	All Branches Except EEE
4	Total Quality Management	ME	All Branches Except ME
5	Safety in Engineering Industry	ME	All Branches
6	Transducers and Sensors	ECE	All Branches Except ECE
7	Drone Technology	ECE	All Branches
8	Introduction to Computer Networks	CSE	CE, EEE, ME and ECE
9	Internet of Things	CSE	CE, EEE, ME and ECE
10	Multimedia & Animation	CSE	All Branches
11	Advanced Information Systems	CSE	CE, EEE, ME and ECE
12	Quantum Computing	CSE	All Branches
13	Financial Mathematics	HBS	All Branches
14	Sensors and Actuators for Engineering Applications		
15	Chemistry of Nanomaterials and Applications		
16	Literary Vibes		

GEO-SPATIAL TECHNOLOGIES (GST)

VII Semester: All Branches Except CE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE715	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understand raster-based spatial analysis techniques, including query, overlay, and cost- distance analysis.
CO2:	Analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
CO3:	Apply network analysis techniques for geocoding, shortest path analysis, and location- allocation problems.
CO4:	Evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
CO5:	Assess GIS customization, WebGIS, and mobile mapping techniques for real-world applications.

UNIT – I

Raster Analysis

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering- Zonal Operations-Statistical Analysis–Cost- Distance Analysis-Least Cost Path.

UNIT – II

Vector Analysis

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co-Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance **Topological Analysis:** Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line- In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering.

UNIT – III

Network Analysis: Network – Introduction **-** Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path inA Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis.

UNIT – IV

Surface And Geostatistical Analysis: Surface Data – Sources of X,Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram

UNIT – V

Customisation, Webgis, Mobile Mapping:

Customisation of Gis: Need, Uses, Scripting Languages –Embedded Scripts

Web Gis: Web Gis Architecture, Advantages Of Web Gis, Web Applications-

Location Based Services: Emergency And Business Solutions.

Text Books:

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008
2. Lo, C.P. andYeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

Reference Books:

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley,2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, —An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub.,2008

Online Learning Resources:

9. https://archive.nptel.ac.in/courses/105/105/105105202/
10. https://onlinecourses.nptel.ac.in/noc19_cs76/preview

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

SOLID WASTE MANAGEMENT (SWM)

VII Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE716	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
CO2:	Analyze engineering systems for solid waste collection, storage, and transportation.
CO3:	Apply resource and energy recovery techniques for sustainable solid waste management.
CO4:	Evaluate landfill design, construction, and environmental impact mitigation strategies
CO5:	Assess hazardous waste management techniques, including biomedical and e-waste

UNIT – I

Solid Waste: Definitions, Types of Solid Wastes, Sources of Solid Wastes, Characteristics, and Perspectives; Properties of Solid Wastes, Sampling of Solid Wastes ,Elements of Solid Waste Management-Integrated Solid Waste Management, Solid Waste Management Rules 2016

UNIT – II

Engineering Systems for Solid Waste Management: Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning- Transfer and Transport; Processing Techniques;

UNIT – III

Engineering Systems for Resource and Energy Recovery: Processing Techniques; Materials Recovery Systems; Recovery of Biological Conversion Products–Composting, Preand Post Processing, Types of Composting, Critical Parameters, Problems With Composing - Recovery of Thermal Conversion Products; Pyrolisis, Gasification, RDF - Recovery of Energy From Conversion Products; Materials and Energy Recovery Systems.

UNIT – IV

Landfills: Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills –Types of Liners – Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation.

UNIT – V

Hazardous Waste Management: Sources and Characteristics, Effects On Environment, Risk Assessment – Disposal of Hazardous Wastes – Secured Landfills, Incineration - Monitoring – Biomedical Waste Disposal, E-Waste Management, Nuclear Wastes, Industrial Waste Management.

Text Books:

1. Tchobanoglous G, Theisen Hand Vigil SA, Integrated Solid Waste Management, Engineering Principles and Management Issues, McGraw Hill, 1993.

2. Vesilind PA, Worrell W and Reinhart D, Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.

Reference Books:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, Environmental Engineering', McGraw Hill Inc., New York, 1985.

2. Qian X, Koerner RM and Gray DH, _Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/105/103/105103205/

2. https://archive.nptel.ac.in/courses/120/108/120108005/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

ELECTRIC VEHICLES (EV)

VII Semester: All Branches Except EEE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE717	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
CO2:	Understand Various dynamics of Electric Vehicles.
CO3:	Remember and understand various configurations in parameters of EV system and dynamic aspects of EV.
CO4:	Analyze fuel cell technologies in EV and HEV systems
CO5:	Analyze the battery charging and controls required of EVs.

UNIT – I

Introduction to EV Systems and Energy Sources: Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

UNIT – II

EV Propulsion and Dynamics: Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi- motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.

UNIT – III

Fuel Cells: Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

UNIT – IV

Battery Charging and Control

Battery Charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction.

Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller‘s designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

UNIT – V

Energy Storage Technologies: Role of Energy Storage Systems- Thermal- Mechanical- Chemical- Electrochemical- Electrical - Efficiency of energy storage systems- Super Capacitors-Superconducting Magnetic Energy Storage (SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA

Text Books:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition.
2. Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, 2017,1st Edition.

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt, "Energy Storage in Power Systems" Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition.
3. A.G.Ter-Gazarian, "Energy Storage for Power Systems", the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Elelctric, Hybrid Elelctric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004,1st Edition.
5. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003,2nd Edition.

Online Learning Resources:

1. https://nptel.ac.in/courses/108/102/108102121/
2. https://nptel.ac.in/syllabus/108103009

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

TOTAL QUALITY MANAGEMENT (TQM)

VII Semester: All Branches Except ME | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE718	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understand the basic concepts and evolution of TQM ; Professional ethics and quality costs
CO2:	Understand the concepts of leadership, quality council, strategic planning and communications
CO3:	Apply the methods to improve costumers satisfactions
CO4:	Analyse motivational aspects of employees and functioning of teams
CO5:	Apply TQM tools like P-D-S-A cycle, Benchmarking, FMEA towards achieving TQM objectives

UNIT – I

Quality: Definition; Dimensions of Quality

Total Quality Management (TQM): Definition; basic concepts of / basic approach to TQM; Benefits of TQM, Barriers / Obstacles to TQM implementation; Evolution of TQM

Ethics: Route causes for unethical behaviour; Ethics Management Program

Quality costs

UNIT – II

Leadership: Characteristics of quality leaders; Leadership concepts; Stephen R. Covey's 7 habits of highly effective people; The Deming's philosophy (14 principles)

Quality Council: Composition; Duties of Quality Council

Quality Statements: The Vision and the Mission statements

Seven steps to Strategic Planning

Communications: Interactive and Formal

UNIT – III

Customer Satisfaction: Customer Satisfaction and its importance; Customer perception of quality; Methods to improve customer satisfaction; Customer Feedback; Handling the customer complaints; Service Quality; Customer Retention

UNIT – IV

Employee Involvement

Motivation: Maslow's hierarchy of needs; Achieving a motivated workforce, Employee empowerment

Teams: Characteristics of successful teams; Roles of team members; Common barriers to team progress; Suggestion system; Recognition and Reward; Gain sharing; Benefits of employee involvement

UNIT – V

TQM Tools

The Problem solving method and P-D-S-A cycle

Benchmarking: Reasons to Benchmark; Process of Benchmarking

Failure Modes and Effects Analysis (FMEA): Benefits; Stages of FMEA; Adapting FMEA to service sector

Pareto diagram; Cause and Effects diagram; Scatter diagram

Text Books:

1. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2015.
2. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005.
3. Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017.

Reference Books:

1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.
2. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.
3. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995

Online Learning Resources

1. https://www.youtube.com/watch?v=VD6tXadibk0
2. https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
3. https://blog.capterra.com/what-is-total-quality-management/
4. https://nptel.ac.in/courses/110/104/110104080/
5. https://onlinecourses.nptel.ac.in/noc21_mg03/preview
6. https://nptel.ac.in/courses/110/104/110104085/
7. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

SAFETY IN ENGINEERING INDUSTRY (SEI)

VII Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE719	OE-IV	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Understand the principles of safety management including safety audit, safety education and accident investigation.
CO2:	Understand the causes and implication of fire and explosion and the preventive measures
CO3:	Understand machine and construction safety assessment and safeguarding methods
CO4:	Understand the effect of toxic substances and hazardous chemicals
CO5:	Understand the modes of electrical hazards and safety measures in electrical and information technology industries

UNIT – I

Safety in Engineering Industry: Safety need, General hazards and control measures in engineering industry, Four significant industrial disasters happened in the world (Bhopal, Chernobyl, Flixborough and Rana plaza), Safety audit procedure.

Accident Investigation: Learning from accident, Layered investigations, Investigation process and summary.

UNIT – II

Fire Safety: The fire triangle, Explosions, Distinction between fire and explosions, Flammability characteristics of liquids and vapours, Fire protection techniques, Fire extinguishers, Fire hazard and analysis, Prevention of fire, Steps after occurrence of fire, Fire detection, Fire alarm and firefighting systems, Explosion proof equipment and instruments.

UNIT – III

Machine Safety: Machine guarding, Machine guarding assessment, Safeguarding machines and equipment, Guards, Safeguarding devices, Other potential safeguards.

Construction Safety: Scope, Safety in - Underground works, Above ground works, Under waterworks, Demolition works.

UNIT – IV

Chemical Safety: Hazardous chemicals, Definition of a hazardous chemical, Toxic effects, Working with toxins, Storing hazardous chemicals, Process hazards, Transportation of hazardous chemicals, Chemical waste management, Hazardous chemical emergency procedures, Worker contamination, Chemicals and worker health.

UNIT – V

Electrical Safety: Electrical dangers, Electrical pathways, Static electricity, Result of

electrical contact, Shock versus electrocution, Electrical burns, Handling electrical hazards, Controlling electrical hazards, Training, Safety and Health program.

IT Industry Safety: Hazardous in IT industry, General precautions, Employer's responsibility, Employees responsibilities, Office ergonomics, Computer workstation – health & safety tips, Laptop safety precautions.

Text Books:

1. L M Deshmukh, Industrial Safety and Management, McGraw Hill Education (India)
2. D A Crowl and J F Louvar, Chemical Process Safety (Fundamentals with Applications), Prentice Hall, 2011.
3. Charles D Reese, Industrial Safety and Health for People-oriented Services, CRC Press, 2008.
4. M P Poonia and S C Sharma. Industrial Safety and Maintenance Management, Khanna Book Publishing, 2019.

Reference Books:

1. Charles Reese, Industrial Safety and Health for Infrastructure Services, CRC Press, 2009
2. R K Jain and Sunil S Rao, Industrial Safety and Health and Environment Management Systems, Khanna Book Publishing, 2000.
3. K U Mistry, Fundamentals of Industrial safety and Health, Siddharth Prakashan Publisher, 2008.

Online Learning Resources

1. https://archive.nptel.ac.in/courses/110/105/110105094/

Question Paper Pattern:

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

TRANSDUCERS AND SENSORS (T&S)

VII Semester: All Branches Except ECE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE720	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Understand characteristics of Instrumentation System and the operating principle of motion transducers.
CO2:	Explore working principles, and applications of different temperature transducers and Piezo-electric sensors
CO3:	Gain knowledge on flow transducers and their applications.
CO4:	Learn the working principles of pressure transducers.
CO5:	Understand the working principle and applications of force and sound transducers.

UNIT – I

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers

UNIT – II

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics.

Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

UNIT – III

Flow Transducers: Bernoulli‘s principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

UNIT – IV

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.

UNIT – V

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone.

Text Books:

1. A.K. Sawhney, A course in Electrical and Electronics Measurements and Instrumentation‖, Dhanpat Rai& Co. 3rd edition Delhi, 2010.

2. Rangan C.S, Sarma G.R and Mani V S V, Instrumentation Devices and Systems‖, TATA McGraw Hill publications, 2007.

Reference Books:

1. Doebelin. E.O, ―Measurement Systems Application and Design‖, McGraw Hill International, New York, 2004.

2. Nakra B.Cand Chaudhary K.K , ―Instrumentation Measurement and Analysis‖, Second Edition, Tata McGraw-Hill Publication Ltd.2006.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

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DRONE TECHNOLOGY (DT)

VII Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE721	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand the historical development of unmanned aerial vehicles
CO2:	Understand different drone parts and their contribution for successful flight operation
CO3:	Identify the battery to be used for UAV application.
CO4:	Understand work in go f motor that can be used in UAV.
CO5:	Classify different microcontrollers and flight controllers.

UNIT – I

Introduction to Drones and Their Applications: Definition of drones, history of drones, Structural classification of drones: - fixed wing structure, lighter than air systems, rotary wings aircraft and applications of drones.

UNIT – II

Components of Drones: classifications of drone structures and their suitability, applications and uses of drone frame materials, classifications and applicability of propeller motors, drone materials, design parameters for propellers, composition and structuring of Electronic speed controller, flight control board, characteristics of FCB and their structure.

UNIT – III

Battery and its Management: Introduction of Battery, Description of Li-Po Battery, Charging / Discharging of Battery. Back up, Ratings, Shelf Life, Maintenance and safety of Battery. Selection criteria of Battery for Drone application

UNIT – IV

Sensors: Wi-Fi devices, RADAR and range finder, GPS receiver, Gyro sensor, Speed and Distance sensor, Image sensor, TOF sensor, Chemical sensor. Cameras in drones and selection criteria Of camera for different range. Barometers, Accelerometer, Magnetometer, remote control for drone.

Motors: Difference between AC and DC motors and stepper motor, Brushed and Brushless motors, brief idea of motor capabilities for a drone build. Selection criterion of motor for drone application. Working and application of BLDC motor

UNIT – V

Connections and Interfaces of Devices in Drone: Brief introduction of RS232, RS422, RS485, UART ports. Different types of connectors and their specifications. Microcontroller interfacing techniques.

Introduction to Drone Programming: Introduction to programming language used in drone: C and Python. Installation of cards. Auto Pilot software i.e. Ardupilot, Openpilot

Text Books:

1. Terry Kil by and Belinda Kil by, “Make: Getting Started with Drones“, Maker Media, Inc, 2016

2. Vasilis Tzivaras, “Buildinga Quadcopter with Arduino”, Packt Publishing, 2016

3. Donald Norris, “Build Your Own Quadcopter - Power Up Your Designs with the Parallax Elev - 8”, McGraw – Hill Education, 2014

Reference Books:

1. Baichtal, “Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs”, Que Publishing, 2016.

2. Austin, Unmanned Aircraft Systems: UAVS Design, Development and Deployment. Wiley, 2010.

3. Sebbane, Smart Autonomous Aircraft: Flight Control and Planning for UAV. CRCPress,2015

4. Zavrsnik, Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance. Springer, 2015.

Online Learning Resources:

1. https://www.dronezon.com/learn-about-drones-quadcopters/

2. http://ardupilot.org/copter/docs/advanced-multicopter-design.html

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

INTRODUCTION TO COMPUTER NETWORKS (ICN)

VII Semester: CE, EEE, ME and ECE | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE722	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Describe the architecture of the Internet, reference models, and explain different types of transmission media used in networking.
CO2:	Apply error detection and correction techniques and analyze data link layer protocols and LAN technologies.
CO3:	Explain routing algorithms and the structure of the network layer, including internetworking
CO4:	Analyze the working of transport layer protocols like TCP and UDP, including concepts of connection management and congestion control.
CO5:	Explain the principles of network applications and describe the functionality of protocols such as HTTP, SMTP, DNS, and peer-to-peer systems, including multimedia streaming and content delivery networks.

UNIT – I

Computer Networks and the Internet: What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks, Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission

UNIT – II

The Data Link Layer, Access Networks, and LANs: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols , Introduction to the Link Layer, Error-Detection and Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks

Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request

UNIT – III

The Network Layer: Routing Algorithms, Internetworking, The Network Layer in The Internet

UNIT – IV

The Transport Layer: Connectionless Transport: UDP , The Internet Transport Protocols: TCP, Congestion Control

UNIT – V

Principles of Network Applications: Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet‘s Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks

Text Books:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, ―Computer Networking: A Top-Down Approach‖,

6thedition, Pearson, 2019.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication
2. Youlu Zheng, Shakil Akthar, Networks for Computer Scientists and Engineers, Oxford Publishers, 2016.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105183
2. https://gaia.cs.umass.edu/kurose_ross/interactive/
3. https://www.netacad.com/courses/packet-tracer
4. https://www.geeksforgeeks.org/computer-network-tutorials/

Question Paper Pattern:

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End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

INTERNET OF THINGS (IOT)

VII Semester: CE, EEE, ME and ECE | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE723	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand general concepts of Internet of Things.
CO2:	Apply design concept to IoT solutions.
CO3:	Analyze various M2M and IoT architectures.
CO4:	Evaluate design issues in IoT applications.
CO5:	Create IoT solutions using sensors, actuators and Devices.

UNIT – I

Introduction to IoT: Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, , Embedded Systems.

UNIT – II

Prototyping IoT Objects using Microprocessor/Microcontroller: Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors. Communication: communication through Bluetooth, Wi-Fi.

UNIT – III

IoT Architecture and Protocols: Architecture Reference Model- Introduction, , IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak

UNIT – IV

Device Discovery and Cloud Services for IoT: Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT – V

UAV IoT : Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software – Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study Flyt Base.

Text Books:

1. Vijay Madisetti and Arshdeep Bahga, — Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016..

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, — From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama

C. Raman, CRC Press.

3. Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, 1st Edition, Apress Publications, 2013

4. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 9781-4493- 9357-1

5. DGCA RPAS Guidance Manual, Revision 3 – 2020

6. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Online Learning Resources:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

MULTIMEDIA & ANNIMATION (MMA)

VII Semester: All Branches | **Scheme:** 2023

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE724	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration:** 3 Hrs

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

CO1:	Understand the basic components of a multimedia project.
CO2:	Understand the usage of text and formats in multimedia.
CO3:	Understand the audio digitization, audio file format and audio software.
CO4:	Understand the colour, image, image formats and Correction in multimedia.
CO5:	Understand the digital video standards, formats and basic principles behind animation and Techniques.

UNIT – I

Introduction to Multimedia: What is multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media.

UNIT – II

Computer Fonts and Hypertext: Usage of text in Multimedia, Families and faces of fonts, outline fonts, bitmap fonts, International character sets and hypertext, Digital fonts techniques.

UNIT – III

Audio fundamentals and representations: Digitization of sound, frequency and bandwidth, decibel system, data rate, audio file format, Sound synthesis, MIDI, wavetable, Compression and transmission of audio on Internet, Adding sound to your multimedia project, Audio software and hardware.

UNIT – IV

Image fundamentals and representations: Colour Science, Colour, Colour Models, Colour palettes, Dithering, 2D Graphics.

Image Compression and File Formats: GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF, Basic Image Processing, Use of image editing software, White balance correction, Dynamic range correction, Gamma correction, Photo Retouching.

UNIT – V

Video and Animation: Video Basics, How Video Works, Broadcast Video Standards, Analog video, Digital video, Video Recording and Tape formats, Shooting and Editing Video, Video Compression and File Formats. Video compression based on motion compensation, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21, Animation: Cell Animation, Computer Animation, Morphing.

Text Books:

1. Tay Vaughan, “Multimedia making it work”, Tata McGraw-Hill, 2008.
2. Rajneesh Aggarwal & B. B Tiwari, “ Multimedia Systems”, Excel Publication, New Delhi,

2007.

3. Li & Drew, " Fundamentals of Multimedia" , Pearson Education, 2009

Reference Books:

1. Parekh Ranjan, "Principles of Multimedia", Tata McGraw-Hill, 2007

2. Anirban Mukhopadhyay and Arup Chattopadhyay, "Introduction to Computer Graphics and Multimedia", Second Edition, Vikas Publishing House.

Online Learning Resources:

1. https://www.wisdomjobs.com/e-university/multimedia-tutorial-270.html
2. http://www.multimediatrainingvideos.com/
3. https://www.tutpad.com/tag/multimedia

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

ADVANCED INFORMATION SYSTEMS (AIS)

VII Semester: CE, EEE, ME and ECE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE725	OE-IV	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

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

CO1:	Demonstrate the Object oriented concepts.
CO2:	Interpret different types of Inheritance and Polymorphism.
CO3:	Classify layer functionalities of OSI reference model and TCP Protocol suite.
CO4:	Summarize the concepts of internetworking, security and IP addressing.
CO5:	Demonstrate different types of protocols and web contents used in web design

UNIT – I

Introduction to Object Oriented Concepts: Introduction, Programming Techniques, Introduction to Object Oriented Concepts, Concept of Structured Procedural Programming, Class, Object

Characteristics of Objects: Data Abstraction, Classification, Encapsulation and Message Passing. Access Specifiers in Class, UML Class Diagrams.

UNIT – II

Advanced Concepts in Object Oriented Technology: Relationships, Inheritance- Protected Access Specifier, Multiple and Multilevel Inheritance, Generalization and Specialization, Abstract classes, Polymorphism, Implementation of OOC through C++.

UNIT – III

Introduction to Computer Networks: Introduction, Network Topology, OSI Reference Model, TCP Protocol Suite, Routing Devices, Types of Networks.

UNIT – IV

Internetworking: Protocols for Internetworking, Internet Address and Domains, Packets, Packet Switched Networks, Virtual Private Networks, and Working of Internet.

UNIT – V

Introduction to Web Technology: Introduction, Hyper Text Transfer Protocol (HTTP), File Transfer Protocol (FTP), Domain Name Server (DNS), Web Applications, Types of Web Content, Multi-Tier Web Applications, Performance of Web Applications.

Text Books:

1. Campus Connect Foundation Programme – Object Oriented Concepts – System
2. Campus Connect Foundation Programme – Computer Hardware and System Software - Vol. – 3, INFOSYS Concepts

Reference Books:

1. Campus Connect Foundation Programme – Relational Database Management System,Client Server

Online Learning Resources:

1. https://www.tutorialspoint.com/cplusplus/
2. https://www.geeksforgeeks.org/computer-network-tutorials/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

QUANTUM COMPUTING (QC)

VII Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE726	OE-IV	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Explain the fundamental concepts of quantum mechanics used in computing.
CO2:	Construct and analyze quantum circuits using standard gates.
CO3:	Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.
CO4:	Develop simple quantum programs using Qiskit or similar platforms.
CO5:	Analyze applications and challenges of quantum computing in real-world domains.

UNIT – I

Fundamentals of Quantum Mechanics and Linear Algebra: Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.

UNIT – II

Quantum Gates and Circuits: Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

UNIT – III

Quantum Algorithms and Complexity: Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

UNIT – IV

Quantum Programming and Simulation Platforms: Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

UNIT – V

Applications and Future of Quantum Computing: Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.

Text Books:

1. Michael A Nielsen, Isaac L Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.

3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

Reference Books:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.

2. Phillip Kaye, Raymond Laflamme and Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.

3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

FINANCIAL MATHEMATICS (FM)

VII Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE727	OE-IV	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Explain fundamental financial concepts, including arbitrage, valuation, and risk.
CO2:	Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts..
CO3:	Analyze mathematical techniques for pricing options and financial derivatives.
CO4:	Evaluate interest rate models and bond pricing methodologies.
CO5:	Utilize computational techniques such as Monte Carlo simulations for financial modeling.

UNIT – I

Asset Pricing and Risk Management: Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis.

UNIT – II

Stochastic Models in Finance: Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito‘s Lemma, Ito Integral, and Ito Isometry.

UNIT – III

Interest Rate and Credit Modelling: Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR),Hull & White models, Credit risk modelling: Hazard function and hazard rate.

UNIT – IV

Fixed-Income Securities and Bond Pricing: Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.

UNIT – V

Exotic Options and Computational Finance: Stochastic volatility models and the Feynman-Kac theorem. Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

Text Books:

1. Ales Cerny, Mathematical Techniques in Finance: Tools for Incomplete Markets, Princeton University Press.
2. S.R. Pliska, Introduction to Mathematical Finance: Discrete-Time Models, Cambridge

University Press.

Reference Books:

1. Ioannis Karatzas& Steven E. Shreve, Methods of Mathematical Finance, Springer, New York.
2. John C. Hull, Options, Futures, and Other Derivatives, Pearson.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (SAEA)								
VII Semester: All Branches						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OE728	**OE-IV**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course, students will be able to	
CO1:	To provide exposure to various kinds of sensors and actuators and their engineering applications.
CO2:	To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
CO3:	To explain the operating principles of various sensors and actuators
CO4:	To educate the fabrication of sensors
CO5:	To explain the required sensor and actuator for interdisciplinary application

UNIT – I

Introduction to Sensors and Actuators

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT – II

Temperature and Mechanical Sensors

TemperatureSensors: Typesoftemperaturesensorsandtheirbasicprincipleofworking:Thermo-resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

UNIT – III

Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles

Acoustic Sensors: Principle and working of Ultrasonicsensors, Piezo-electricresonators, Microphones

UNIT – IV

Magnetic and Electromagnetic Sensors: Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect

sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

UNIT – V

Chemical and Radiation Sensors

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Text Books:

1. Sensors andActuators– Clarence W.deSilva, CRC Press, 2nd Edition, 2015
2. Sensors andActuators, D.A. Halland C.E.Millar, CRC Press, 1999

Reference Books:

1. Sensors and Transducers-D.Patranabhis,Prentice Hall of India(Pvt)Ltd.2003
2. Measurement, Instrumentation, and Sensors Handbook John G.Webster, CRC Press 1999
3. Sensors–A Comprehensive Sensors-Henry Bolte, John Wiley.
4. Hand book of modern sensors, Springer, Stefan Johann Rupitsch

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

CHEMISTRY OF NANO MATERIALS AND APPLICATIONS (CNMA)

VII Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE729	OE-IV	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Classify the nano structur ematerials; describe scope of nano science and importance of technology.
CO2:	Describe the top-down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapor deposition method and electrode position method, Discuss about high energy ball milling.
CO3:	Discuss different technique for characterization of nano material, Explain electron Microscopy techniques for characterization of nano material, Describe BET method for surface area analysis.
CO4:	Explain synthesis and properties and applications of nanao materials, Discuss about fullerenes and carbon nano tubes, Differentiate nano magnetic materials and thermo electric materials, nonlinear optical materials.
CO5:	Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

UNIT – I

Basics and Characterization of Nano materials: Introduction, Scope of nano science and nano technology, nano science in nature, classification of nano structured materials, importance of nano materials.

UNIT – II

Synthesis of Nano Materials: Top-Down approach, Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electro deposition method, high energy ball milling method.

Synthetic Methods: Bottom-Up approach, Sol-gel synthesis, micro emulsions orrever semicelles, co-precipitation method, solvo thermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis

UNIT – III

Techniques for Characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination

UNIT – IV

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

UNIT – V
Advanced Engineering Applications of Nanomaterials: Applications ofNano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation
Text Books:
1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, Baldev Rai, B B Rath and James Murday, Univ. Press, 2012.
Reference Books:
1. Concepts of Nanochemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures &Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions. **End Examination:** The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

LITERARY VIBES (LB)

VII Semester: All Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OE730	OE-IV	3	0	0	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1:	Identify genres, literary techniques and creative uses of language in literary texts.
CO2:	Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces
CO3:	Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments
CO4:	Analyze the underlying meanings of the text by using the elements of literary texts
CO5:	Evaluate their own work and that of others critically
CO6:	Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance

UNIT – I

Poetry:

1. Ulysses- Alfred Lord Tennyson
2. Ain't I woman?-Sojourner Truth
3. The Second Coming-W.B. Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

UNIT – II

Drama: Twelfth Night- William Shakespeare

Shakespeare -life and works

1. Plot & sub-plot and Historical background of the play
2. Themes and Criticism
3. Style and literary elements
4. Characters and characterization

UNIT – III

Short Story:

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wild
3. Three Questions – Leo Tolstoy
4. Grief –Antony Chekov

UNIT – IV

Prose: Essay and Autobiography

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston

3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly

UNIT – V

Novel: Hard Times- Charles Dickens

1. Charles Dickens-Life and works
2. Plot and Historical background of the novel
3. Themes and criticism
4. Style and literary elements
5. Characters and characterization

Text Books:

1. Charles Dickens.Hard Times.(Sangam Abridged Texts) Vantage Press, 1983
2. DENT JC.William Shakespeare. Twelfth Night. Oxford University Press,2016.

Reference Books:

1. WJ Long.History of English Literature, Rupa Publications India; First Edition (4 October 2015)
2. RK Kaushik And SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University Press .2018.
3. Dhanvel, SP. English and Soft Skills, Orient Blackswan,2017.
4. New Horizon, Pearson publications, New Delhi 2014
5. Vimala Ramarao, Explorations Volume-II, Prasaranga Bangalore University,2014.
6. Dev Neira, Anjana & Co. Creative Writing: A Beginner's Manual.Pearson India, 2008.

Online Learning Resources:

1. https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses
2. https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis
3. https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette
4. https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/
5. https://www.litcharts.com/lit/twelfth-night/themes
6. https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/

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