



Shirpur Education Society's
R. C. Patel Institute of Technology,
Shirpur

An Autonomous Institute

Affiliated to DBATU, Lonere (M.S.),

Approved by AICTE, New Delhi and Govt. of Maharashtra

(DTE: EN - 5172)

Accredited by NAAC 'A' Grade, Bangalore.

Course Curriculum Structure
Electronics & Telecommunication Engineering

Final Year B. Tech

Batch: 2022-2026

With Effect from Academic Year 2025-26



Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405

www.rcpit.ac.in

Semester-VII (w.e.f. Academic Year 2025-26)

Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit	Total
				L	T	P	Continuous Assessment (CA)			ESE				
							TA	TT1	TT2		Average of TT1 & TT2			
							A	B	C		A+B+C			
1	PC	22PCET7010T	Microwave Engineering	3	--	--	25	10	10	10	65	100	3	4
2	PC	22PCET7010L	Microwave Engineering Laboratory	--	--	2	25	--	--	--	25	50	1	
3	PC	22PCET7020T	Mobile Communication System	3	--	--	25	10	10	10	65	100	3	4
4	PC	22PCET7020L	Mobile Communication System Laboratory	--	--	2	25	--	--	--	25	50	1	
5	PC	22PCET7030T	Internet of Things	3	--	--	25	10	10	10	65	100	3	4
6	PC	22PCET7030L	Internet of Things Laboratory	--	--	2	25	--	--	--	25	50	1	
7	PE @	22PEET7041T	Artificial Intelligence & Machine Learning	3	--	--	25	10	10	10	65	100	3	4
		22PEET7041L	Artificial Intelligence & Machine Learning Laboratory	--	--	2	25	--	--	--	25	50	1	
		22PEET7042T	Robotics	3	--	--	25	10	10	10	65	100	3	
		22PEET7042L	Robotics Laboratory	--	--	2	25	--	--	--	25	50	1	
		22PEET7043T	Power Electronics	3	--	--	25	10	10	10	65	100	3	
		22PEET7043L	Power Electronics Laboratory	--	--	2	25	--	--	--	25	50	1	
		22PEET7044T	Data Compression & Encryption	3	--	--	25	10	10	10	65	100	3	
		22PEET7044L	Data Compression & Encryption Laboratory	--	--	2	25	--	--	--	25	50	1	
		22PEET7045T	Speech Processing	3	--	--	25	10	10	10	65	100	3	
		22PEET7045L	Speech Processing Laboratory	--	--	2	25	--	--	--	25	50	1	
		22PEET7046T	Embedded Systems	3	--	--	25	10	10	10	65	100	3	
		22PEET7046L	Embedded Systems Laboratory	--	--	2	25	--	--	--	25	50	1	
22PEET7047T	Advanced VLSI	3	--	--	25	10	10	10	65	100	3			
22PEET7047L	Advanced VLSI Laboratory	--	--	2	25	--	--	--	25	50	1			
8	OE#	22OEET7051T	Product Life Cycle Management	3	--	--	25	10	10	10	65	100	3	3
		22OEET7052T	Management Information System	3	--	--	25	10	10	10	65	100	3	
		22OEET7053T	Operations Research	3	--	--	25	10	10	10	65	100	3	
		22OEET7054T	Cyber Security and Laws	3	--	--	25	10	10	10	65	100	3	

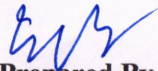


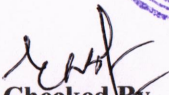
		22OEET7055T	Personal Finance Management	3	--	--	25	10	10	10	65	100	3	
		22OEET7056T	Energy Audit and Management	3	--	--	25	10	10	10	65	100	3	
		22OEET7057T	Public Systems and Policies	3	--	--	25	10	10	10	65	100	3	
		22OEET7058T	Science of Well-being	3	--	--	25	10	10	10	65	100	3	
		22OEET7059T	Research Methodology	3	--	--	25	10	10	10	65	100	3	
9	PC	22PCET7050L	Industrial Automation Laboratory	--	--	2	25	--	--	--	25	50	1	1
10	PJ	22PJET7060L	Project Stage-II	--	--	4	25	--	--	--	25	50	2	2
11	ES	22ESET7070L	Full Stack Development	--	--	2	25	--	--	--	25	50	1	1
Total				15	0	16	300	--	--	50	500	850	23	23


PC: Program Core, **PE:** Professional Elective, **OE:** Open Elective, **PJ:** Project, **TA:** Teachers Assessment, **TT1:** Term Test-1, **TT2:** Term Test-2


@ Any 1 Professional Elective Course, # Any 1 Open Elective Course





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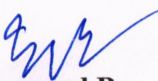

Director
Prof. Dr. J.B. Patil
DIRECTOR
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Shirpur Dist: Dhule (MS)

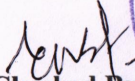
Semester-VIII (w.e.f. Academic Year 2025-26)

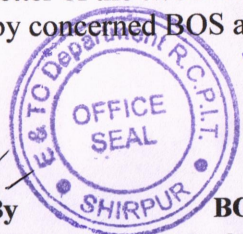
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit	Total
				L	T	P	Continuous Assessment (CA)				ESE			
							TA	TT1	TT2	Average of TT1 & TT2				
A	B	C	A+B+C											
1	PE	22PEET8011T	5G Technology *	3	--	--	25	10	10	10	65	100	3	3
		22PEET8012T	Computer Vision *	3	--	--	25	10	10	10	65	100	3	
		22PEET8013T	Satellite Communication *	3	--	--	25	10	10	10	65	100	3	
		22PEET8014T	Internet Engineering & Network Security *	3	--	--	25	10	10	10	65	100	3	
		--	NPTEL / Swayam Course #	3	--	--	25	10	10	10	65	100	3	
2	PE	22PEET8021T	Machine Learning for Signal Processing *	3	--	--	25	10	10	10	65	100	3	3
		22PEET8022T	Advanced Digital Signal Processing *	3	--	--	25	10	10	10	65	100	3	
		22PEET8023T	Microwave Amplifier & Oscillator Design *	3	--	--	25	10	10	10	65	100	3	
		--	NPTEL / Swayam Course #	3	--	--	25	10	10	10	65	100	3	
3	INT	22INTET8030L	Internship	--	--	20	150	--	--	--	150	300	10	10
4	MC	22MCET8040T	Disaster Management and Preparedness	2	--	--	--	--	--	--	--	--	Audit	Audit
Total				8	--	20	200	20	20	20	280	500	16	16

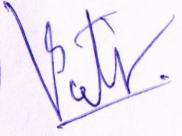
PE: Professional Elective, **INT:** Internship **TA:** Teachers Assessment, **TT1:** Term Test-1, **TT2:** Term Test-2, **ESE:** End Semester Examination


- Any 1 Professional Elective from each Group
- * Professional Elective Courses offered for students doing Internship at institute level.
- # Professional Elective Courses offered for students doing Internship at Industry. These courses are to be studied in self-study mode using NPTEL/Swayam platform.
- Students doing internship at industry shall submit certificate of NPTEL examination OR they have to appear examinations conducted by institute like TT1, TT2 and ESE.
- Students undergoing internship have the option to appear for both the NPTEL examination and the End Semester Examination (ESE) conducted by the institute for the respective course. In such cases, the better of the two scores (NPTEL or ESE) shall be considered for final grading.
- List of NPTEL Courses will be declared by concerned BOS at the beginning of Semester-VIII.

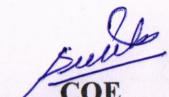

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Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Microwave Engineering (22PCET7010T)	
Microwave Engineering Laboratory (22PCET7010L)	

Pre-requisite:

- Electromagnetic and Wave Propagation
- Radiating Systems

Course Objectives:

- To understand the basics of Microwave Communication Systems.
- To understand various Microwave Devices and Measuring Techniques.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze propagation through guiding media using Wave equation and design various Impedance Matching Techniques.	L4	Analyze
CO2	Analyze functioning of different Microwave components.	L4	Analyze
CO3	Analyze Microwave Tubes and derive expressions of necessary performance parameters for them.	L4	Analyze
CO4	Explain measurement techniques to measure various circuit parameters at microwave frequency and carry out experimental verification for the same.	L2	Understand

Microwave Engineering (22PCET7010T)

COURSE CONTENTS

Unit-I **Basics of Microwave Communication Systems** **2 Hrs.**

Microwave Frequency Bands in Radio Spectrum, Characteristics, Advantages and Applications of Microwaves.

Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnections of Two port networks. High Frequency parameters, Formulation of S- parameters, Properties of S- parameters.

Unit-II **Waveguides and Impedance matching Network and Passive** **10 Hrs.**

Devices

Rectangular waveguides: Construction, Working and Mode analysis and Applications. Circular and Ridge Waveguide: Construction and Applications. Design of Impedance matching network using distributed parameters.

Unit-III **Passive and Semiconductor Microwave Devices** **12 Hrs.**

Tees, Hybrid ring, Directional couplers, Phase shifters, Terminations, Attenuators and Ferrite devices such as Isolators, Gyrotors, and Circulators.

Diodes: Varactor, PIN, Tunnel, Point Contact, Schottky Barrier, Gunn, IMPATT.

Transistors: BJT, Hetro-junction BJT, MESFET and HEMT (construction, working, equivalent circuit and performance characteristics).

Unit-IV **Microwave Generation and Amplification** **10 Hrs.**

Two Cavity Klystron, Multi-Cavity Klystron and Reflex Klystron. Helix Travelling Wave Tube and Cross Field Amplifier. Backward Wave Oscillator, Cylindrical Magnetron and Gyrotron.

Unit-V **Microwave Measurements** **4 Hrs.**

VSWR, Frequency, Power, Impedance, Attenuation, Dielectric Constant.

Unit-VI **Microwave Application and Modern Trends in Microwave** **4 Hrs.**

Engineering

Effects of Microwave radiation on human body, Microwave hazards. Medical (Microwave Imaging, Microwave Diathermy) and Civil applications (Microwave heating, Instrumentation landing Systems, Radar Navigation Systems) of microwaves.

Microwave Engineering Laboratory (22PCET7010L)

List of Laboratory Experiments: (Any Eight)

1. Study of Microwave Components.
2. Measurement of Microwave frequency using Microwave Bench Setup.
3. Measurement of Attenuation using Microwave Bench Set-up.
4. Study of Various Modes of Reflex Klystron
5. Compare Analytical and Graphical Method of Impedance Matching for Single Stub.
6. Study of Microwave Hazards.
7. Measurement of Wavelength, VSWR and Unknown load using Microwave Bench Set-up.
8. Measurement of S-parameters for various microwave components.
9. Design and Simulation of Branch line coupler.
10. Mode Pattern Analysis for Rectangle Waveguide.

(Minimum eight experiments from the above suggested list or any other experiment based on syllabus to be included, which would help the learner to apply the concept learnt.)

Text Books

1. Samuel Liao, Microwave Devices and Circuits, 3rd Edn, Prentice Hall.
2. M. Kulkarni, Microwave and Radar Engineering, 3rd Edn, Umesh Publication.

Reference Books

1. D. M. Pozar, Microwave Engineering, 4th Edn, Wiley Publications. Education.
2. Annapurna Das, Sisir K. Das, Microwave engineering, 3rd Edn, Tata McGraw Hill Publication.
3. Peter A. Rizzi, Microwave Engineering: Passive Circuits, 1st Edn, Prentice Hall.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Mobile Communication System (22PCET7020T)	
Mobile Communication System Laboratory (22PCET7020L)	

Pre-requisite:

- Analog Communication
- Digital Communication
- Computer Networks

Course Objectives:

- To understand the cellular fundamentals and different types of radio propagation models.
- To study the system architecture of 2G, 2.5 G, 3G and 4 G standards and beyond.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Classify different types of propagation models	L2	Understand
CO2	Explain the cellular fundamentals and estimate the coverage and capacity of cellular systems.	L3	Apply
CO3	Illustrate the fundamentals and system architecture of GSM, 2.5G, IS-95 and UMTS	L2	Understand
CO4	Elaborate on the concepts and principles 4G network deployment and optimization.	L3	Apply
CO5	Discuss the emerging technologies for upcoming mobile communication systems. .	L4	Analyze

Unit-VI**Road Map towards 5G****4 Hrs.**

Introduction 5G enabling technologies, Introduction to Femtocell, Femtocell Attributes, Femtocell Standards, Concept of Femtocells, Types of Femtocells Applications of Femtocells.

Mobile Communication System Laboratory (22PCET7020L)

List of Laboratory Experiments: (Any Eight)

1. Study of frequency reuse using Matlab/Scilab.
2. To study performance evaluation of handover for absolute signal strength measurement.
3. Tutorial based on fundamentals of frequency reuse and capacity of cellular communication system.
4. Implementation of adaptive modulation for wireless environment.
5. Study of Rayleigh and Rician fading distribution using Simulink and computation of link budget using Okumura model.
6. Tutorial based on emerging technologies of 4G.
7. Tutorial based on 3GPP LTE.
8. Scilab Based GSM, CDMA Implementations.
9. Verify use of Orthogonal Walsh codes in CDMA environment.
10. Tutorial based on Propagation Models.

List of Laboratory Experiments: Minimum eight experiments from the below suggested list or any other experiment based on syllabus to be included, which would help the learner to apply the concept learnt.

Text Books

1. Theodore S. Rappaport, Wireless communications - principles and practice, 2nd Edn, Pearson.
2. T L Singal, Wireless communications, 2010, Mc Graw Hill Education.
3. Andreas F. Molisch, Wireless communications, 2nd Edn, Wiley India Pvt. Ltd.

Reference Books

1. Upena Dalal, Wireless and Mobile Communications, 2009, Oxford University Press.
2. Vijay K.Garg, Wireless Communications and Networking, 2007, Morgan–Kaufmann series in Networking-Elsevier.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Internet of Things (22PCET7030T)	
Internet of Things Laboratory (22PCET7030L)	

Pre-requisite:

- Digital Communications
- Computer Networks

Course Objectives:

- To introduce the concept of network connected IOT devices.
- To introduce methods to generate and acquire analog and digital sensor data.
- To introduce various data communications and role of layers.
- To introduce methods for data storage and retrieval.
- To outline the formal procedure for connecting to data networks for data transfer.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Summarize the concepts, features and functions of network connected embedded devices.	L2	Understand
CO2	Adopt a suitable communication model for a given IOT application	L3	Apply
CO3	Identify and summarize different components and resources required for IOT applications.	L2	Understand
CO4	Adopt a suitable data model for a given IOT application	L3	Apply
CO5	Analyze the data generated or received in system through Data Analytics tools.	L4	Analyze

Internet of Things (22PCET7030T)

COURSE CONTENTS

Unit-I **IOT Introduction** **8 Hrs.**

Concepts and Definitions of the Internet of Things (IoT), Requirements, Functionalists, and structure of IOT, IoT enabling technologies, IoT Architecture, The major component of IOT (Hardware & Software)

IoT communication models and networking protocols, Role of wired and wireless communication, IoT services and applications, IoT Standards, Examples of IoT.

Unit-II **IOT Data Acquisition & Platforms** **10 Hrs.**

Micro Controllers (Arduino Uno/mega2560, Raspberry-Pi, ARM Cortex M), Real-time systems, and embedded software, OS and Drivers (End Device Program), Hardware & Software Requirements.

Unit-III **IOT Data Communication** **10 Hrs.**

Data transfer data by Wireless / Wired connectivity, Ipv4/Ipv6, Ethernet/GigE, MIPI, M-PHY, UniPro, SPMI, BIF, SuperSpeed USB Inter-Chip (SSIC), Mobile PCIe (M-PCIe) and SPI, GSM 2g ,3g ,4g & 5g, IEEE 802.15.4, IEEE 802.15.4e, 802.11ah, Relay Access Point (AP), Grouping of station, Target Wake Time (TWT)

Unit-IV **IOT Data Storage & Retrieval** **8 Hrs.**

Overview and Role of Storage in Cloud / Server /In house Storage, Databases Connectivity with IOT and uses, Case Study over Mysql / NoSQL / NewSql, Case Study over Cloud Services and Administration, Case Study of Big Data & Hadoop Platforms.

Unit-V **IOT Data Analytics & Visualization** **4 Hrs.**

Analysis of data using the Python language libraries (modules), Visualization and interpretation of Data, Data Cleaning in IoT.

Internet of Things Laboratory (22PCET7030L)

List of Laboratory Experiments: (Any Eight)

1. Basic Embedded operations – I/O toggling, Interrupt handling, Timer operations, periodic event generations, ADC operations, Serial data transfer – numbers and string transmissions.
2. Data Generation – ADC conversion of analog sensors including temperature using NTC, their calibrations and data transfer to PC terminal.
3. Data Generation – Reading digital sensors and data transfer to PC terminal.
4. State machine design – Data flow planning, design and deployment of communication.
5. Communication across network – TCP method.
6. Communication across network – UDP Method.
7. Actuators across network - Trigger of relays and solenoids, DC motor.
8. Actuators across network - Demonstration of the DC motor speed control.
9. Data Display across network – Display data on LCD 16X2 Display and OLED module.
10. IOT Product Development & Testing with Project.

Text Books

1. Raj Kamal, “IoT Architecture and Design Principles”, Tata McGraw Hill, 2017.
2. Colin Dow, “Internet of Things Programming Projects: Build modern IoT solutions with the Raspberry Pi 3 and Python”, Packt Publishing, 2018.
3. Anand Tamboli, “Build Your Own IoT Platform: Develop a Fully Flexible and Scalable Internet of Things Platform in 24 Hours”, Apress, 2019.

Reference Books

1. Kamal, R, "Internet of Things – Architecture and Design Principles", 1 Hill, 2017.
2. Simone Cirani, “Internet of Things- Architectures, Protocols and Standards”, WILEY, 2018.
3. Alessandro Bassi, “Enabling Things to Talk- Designing IoT solutions with the IoT Architectural Reference Model”, Springer, 2013.
4. Constandinos X. Mavrou Moustakis, George Mastorakis, Jordi Mongay Batalla, “Internet of Things (IoT) in 5G Mobile Technologies”, Springer International Publication, 2016.
5. Fadi Al-Turjman, “Artificial Intelligence in IoT”, 1st Edition, Springer International Publishing.
6. Shampa Sen, Leonid Datta, Sayak Mitra, “Machine Learning and IoT: A Biological Perspective”, CRC Press, 2019.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Artificial Intelligence & Machine Learning (22PEET7041T)	
Artificial Intelligence & Machine Learning Laboratory (22PEET7041L)	

Pre-requisite:

- Engineering Mathematics - IV

Course Objectives:

- To teach the basics of Artificial Intelligence and Optimization Algorithms.
- To deliver the fundamental concepts and techniques of Machine Learning.
- To make students familiar with regression, classification and clustering methods.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the concepts of Artificial Intelligence (AI), machine learning, and neural network fundamentals.	L2	Understand
CO2	Describe searching, optimization algorithms, basics of knowledge representation and reasoning in AI, supervised and unsupervised Machine learning techniques.	L2	Understand
CO3	Apply different search and optimization algorithms, logic rules, machine learning techniques, including supervised and unsupervised learning, to solve various problems.	L3	Apply
CO4	Analyze various search and optimization algorithms, performance of different machine learning techniques identifying their strengths, weaknesses.	L4	Analyze

Artificial Intelligence & Machine Learning Laboratory (22PEET7041L)

List of Laboratory Experiments: (Any 8)

1. Find a goal by Breadth First Search (BFS) algorithm.
2. Find a goal by Depth First Search (DFS) algorithm.
3. Find a goal by Deepening Depth First Search (DFID) algorithm.
4. Predicting house prices by Linear Regression.
5. K Nearest neighbour (KNN) classification of Iris dataset.
6. Decision Tree classification with Tennis Dataset.
7. Generate Confusion Matrix for Naive Bayes Classifier.
8. Clustering data by K means clustering algorithm.
9. Find the minimum of a polynomial by Gradient Descent Method.
10. To implement Support Vector Machines.

Text Books

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence", A Modern Approach, Pearson Education, 3rd edition, 1997.
2. Tom M. Mitchell, "Machine Learning", McGraw Hill Education, 1st edition, 2017.

Reference Books

1. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill (India) Pvt. Ltd, 1st edition, 2013.
2. Kevin P. Murphy, "Machine Learning", A Probabilistic Perspective, MIT Press, 2012, 1st edition.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Robotics (22PEET7042T)	
Robotics Laboratory(22PEET7042L)	

Pre-requisite:

- Engineering Mathematics III
- Microcontroller & Applications-I
- Microcontroller & Applications-II.

Course Objectives:

- To understand the functional elements of Robotics.
- To impart the knowledge on direct and inverse Kinematics.
- To cover various path planning methodologies for robotic navigation and task execution.
- To introduce the dynamics of robotic manipulators and the control mechanisms.
- To develop understanding of localization, navigation strategies, and planning techniques.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the basic concepts of robotics.	L2	Understand
CO2	Describe the principles of direct and inverse kinematics in robotic operation.	L2	Understand
CO3	Describe the various path planning techniques, dynamics and control in robotic applications.	L2	Understand
CO4	Write program to use the robot for the various applications.	L3	Apply

Robotics (22PEET7042T)

COURSE CONTENTS

Unit-I **Basic Concepts** **5 Hrs.**

Basic Concepts: Brief History, Types of Robots–Technology-Robot classifications and specifications, Design and Control issues, Various manipulators, Sensors, work cell, Programming languages.

Unit-II **Direct and Inverse Kinematics** **8 Hrs.**

Direct and Inverse Kinematics: Mathematical representation of Robots, Homogeneous transformation Various joints, Degrees of freedom Representation using the Denavit-Hartenberg parameters, Direct Kinematics-Inverse kinematics, Solvability–Solution Methods-Closed form solution, SCARA robots.

Unit-III **Path Planning** **8 Hrs.**

Path Planning: Joint space technique, Use of p-degree polynomial, Cubic polynomial, Cartesian space technique, Parametric descriptions, Straight line and circular paths, Position and orientation planning.

Unit-IV **Dynamics and Control** **7 Hrs.**

Dynamics and Control: Lagrangian mechanics, 2DOF Manipulator, Lagrange Euler formulation, Dynamic model, Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

Unit-V **Service Robotics** **8 Hrs.**

Service Robotics: Need for service robots, Challenges of Localization, Map Representation, Probabilistic Map based Localization, Monte carlo localization, Landmark based navigation, globally unique localization, Route based localization, Path planning overview, Cell decomposition path planning, Potential field path planning, Obstacle avoidance.

Unit-VI **Applications** **6 Hrs.**

Applications: Ariel robots, Collision avoidance, Robots for agriculture, mining, exploration, under-water, civilian and military applications, nuclear applications, Space applications, Humanoids.

Robotics Laboratory(22PEET7042L)

List of Laboratory Experiments: (Any 8)

1. Robot Classification and Specifications.
2. Composite Rotation Transformation Matrix.
3. Composite Homogenous Transformation Matrix.
4. Evaluate Denavit-Hartenberg representation of three axes planar robot with ARM matrix computation.
5. Joint Space Path Planning Using Cubic Polynomial Interpolation in MATLAB.
6. Comparing Joint Space and Cartesian Space Path Planning Techniques in MATLAB.
7. Dynamic Response Analysis of a 2DOF Manipulator Under PID Control in MATLAB.
8. Simulating Path Planning and Obstacle Avoidance.
9. Perform experiment no 1 (Move master) and 2 (Forward Kinematics of PUMA 560) available at the link: <https://mr-iitkgp.vlabs.ac.in>.
10. Programming a 6-DoF Articulated Robot for Automated Loading and Unloading Operations.

Any other experiment based on syllabus may be included which would help the learner to understand topic/concept.

Text Books

1. R. K. Mittal and I. J. Nagrath, “Robotics and Control”, Tata McGraw Hill, 4th Edition, 2005.
2. John J. Craig, “Introduction to Robotics Mechanics and Control”, Pearson Education, 3rd Edition, 2009.

Reference Books

1. Ashitava Ghoshal, “Robotics-Fundamental Concepts and Analysis”, Oxford University Press, 6th Edition, 2010.
2. Edwin Wise, “Applied Robotics”, Cengage Learning, 1st Edition, 2003.
3. K. K. Appu Kuttan, “Robotics”, I K International, 1st Edition, 2007.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Power Electronics (22PEET7043T)	
Power Electronics Laboratory (22PEET7043L)	

Pre-requisite:

- Engineering Mathematics III
- Electronic Devices and Circuits

Course Objectives:

- To develop the understanding of fundamental principles of power electronics.
- To disseminate various power electronic semiconductor devices and their characteristics.
- To develop the concept of power electronic converters and their topologies.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the features and characteristics of power semiconductor devices.	L2	Understand
CO2	Analyze and design triggering, commutation and protection circuits.	L4	Analyze
CO3	Illustrate, analyze and design AC-DC converters.	L4	Analyze
CO4	Illustrate, analyze and design DC-DC converters.	L4	Analyze
CO5	Illustrate, analyze and design DC-AC converters.	L4	Analyze
CO6	Illustrate, analyze and design AC-AC converters.	L4	Analyze

Power Electronics (22PEET7043T)

COURSE CONTENTS

Unit-I	Power Semiconductor Devices	4 Hrs.
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Principle of operation, constructional features and characteristics of: SCR, TRIAC, DIAC, GTO, MOSFET and IGBT.

Unit-II	Triggering, Commutation and Protection	6 Hrs.
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Basic Gate Drive circuits for SCR, TRIAC, MOSFET and IGBT, Methods of commutation of SCR, Methods of protection of SCR.

Unit-III	AC-DC Converters	8 Hrs.
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Uncontrolled half and full wave rectifiers with R and RL load, SCR controlled half and full wave rectifier with R and RL load. Power factor of the controlled rectifier. Effect of source and load inductances.

Unit-IV	DC-DC Converters	8 Hrs.
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Buck, Boost and Buck-Boost converters, Fly back and Cuk converter, DC-DC converters with R and RL load.

Unit-V	DC-AC Converters	8 Hrs.
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Principle of operation and performance parameters, Voltage control of single-phase inverters

Unit-VI	AC-AC Converters	8 Hrs.
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Principle of on-off and phase angle control; performance parameters, Single phase full-wave AC-AC converter with R and RL load

Power Electronics Laboratory (22PEET7043L)

List of Laboratory Experiments: (Any 8)

1. To study V-I characteristics of SCR, DIAC and TRIC.
2. To study V-I characteristics of IGBT.
3. To study different triggering circuits for SCR R Triggering circuit, RC triggering circuit
4. To study class B commutation circuit of SCR.
5. To study Half wave-controlled rectifiers using SCR.
6. To study AC phase control circuit using DIAC and TRIAC.
7. To study totem pole gate triggering circuit for MOSFET.
8. To study uncontrolled and controlled rectifiers.
9. To Study a controlled rectifier with (i) Source Inductance (ii) Freewheeling diode.
10. To study buck and boost converters.
11. To study fly back converters.
12. To study single phase DC to AC converters.
13. To study AC to AC converters.

Any other experiment based on syllabus may be included which would help the learner to understand topic/concept.

Text Books

1. N. Mohan, T. M. Undeland, W. P. Robbins, "Power Electronics: Converters Application and Design", John Wiley & Sons, 2nd edition, 2003.
2. M. H. Rashid, "Power Electronics: Circuits, Devices, and Applications", Pearson Education India, 4th edition, 2014.
3. P.S. Bhimbra, "Power Electronics", Khanna Publishers, 5th edition, 2012.

Reference Books

1. P.C. Sen, "Modern Power Electronics", Wheeler publications, 1st edition, 2005.
2. Ramamurthy, "Thyristor & Their Applications", East-West Press, 2nd edition, 1998.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Data Compression & Encryption (22PEET7044T)	
Data Compression & Encryption Laboratory (22PEET7044L)	

Pre-requisite:

- Engineering Mathematics—III
- Signals and Systems

Course Objectives:

- To introduce different lossy and lossless compression for text audio, image and video.
- To introduce the concept of Symmetric and Asymmetric key cryptography and its applications in security protocols.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe various lossy and lossless techniques.	L2	Understand
CO2	Apply various compression techniques for compression of text, image, audio and video.	L3	Apply
CO3	Describe the range of different cryptosystems and various network security related protocols.	L2	Understand
CO4	Analyze how the basic design criteria for various cryptosystems like confusion, diffusion and number theory are used in cryptographic techniques.	L4	Analyze

Data Compression & Encryption(22PEET7044T)

COURSE CONTENTS

Unit-I	Text Compression	10 Hrs.
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Introduction to data compression, Comparison of lossy and lossless compression, Modelling and Coding, Compression Parameters. Huffman Coding, Adaptive Huffman Coding, Arithmetic coding. Dictionary based compression: Static and Dynamic Dictionary, LZ77, LZ78, LZW.

Unit-II	Image Compression	6 Hrs.
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Differential lossless compression DPCM, JPEG-LS, DCT, JPEG, JPEG 2000.

Unit-III	Audio and Video Compression	6 Hrs.
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Digital Audio, law and A law commanding, MPEG-1 Audio layer (MP3 audio format). Analog Video, Digital Video, MPEG-2, H.261 encoder and decoder.

Unit-IV	Symmetric key cryptography & Key management	8 Hrs.
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Introduction: Security Goals, Security techniques Cryptography and Steganography, Cryptographic attacks.

Symmetric Key Cryptography: Substitution cypher, Transposition Cypher, Stream and Block cypher. DES, Double DES, Triple DES, AES. Key management, Diffie- Hellman Key Exchange.

Unit-V	Asymmetric key cryptography and Message Integrity	8 Hrs.
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Prime numbers, Fermats and Euler's theorem, Chinese Remainder theorem. Principles of Public Key cryptosystem, RSA.

Message Integrity: Message authentication and Hash functions, SHA, HMAC, and Digital Signature Standard.

Unit-VI	Network Security	4 Hrs.
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Email, PGP, S/MIME, Intrusion detection system. Web security considerations, SSL, TLS, Secure Electronic transaction. Kerberos, X.509 authentication service, Public Key Infrastructure.

Data Compression & Encryption Laboratory(22PEET7044L)

List of Laboratory Experiments: (Any 8)

1. To find compression ratio after compression of various file formats.
2. To implement Huffman coding.
3. To implement Arithmetic coding.
4. To implement μ law and a law companding for Audio compression.
5. To implement DCT for image compression.
6. To implement Substitution cypher for text/ image.
7. To implement Transposition cypher for text/ image.
8. To implement square and multiply algorithm.
9. To implement Fermat's theorem.
10. To implement RSA.
11. To implement Diffie-Hellman Key exchange mechanism.
12. To implement PGP.
13. Case study on specific topics.
14. To study X.509 certificate format by downloading few samples from internet.

Minimum eight experiments from the above suggested list or any other experiment based on the syllabus to be included, which would help the learner to apply the concept learnt.

Text Books

1. Khalid Sayood, Introduction to Data Compression, 2nd Edition Morgan Kaufman.
2. William Stallings, Cryptography and Network Security Principles and Practices, 5th Edition Pearson Education.

Reference Books

1. David Saloman, Data Compression: The Complete Reference, Springer.
2. Mark Nelson, Jean- Loup Gailly, The Data Compression Book, 2nd edition, BPB Publications
3. Atul Kahate, "Cryptography and Network Security", McGraw-Hill ,4th Edition, 2019

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Speech Processing (22PEET7045T)	
Speech Processing Laboratory (22PEET7045L)	

Pre-requisite:

- Signals and Systems
- Digital Signal Processing
- Engineering Mathematics

Course Objectives:

- To acquire the fundamentals of the digital signal processing that allows them to assimilate the concepts related to the speech processing.
- To introduce the fundamentals of speech signal processing.
- To present basic principles of speech analysis.
- To give an overview of speech processing applications including speech enhancement, speech recognition and speaker recognition.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the mechanism of human speech production and digital models of speech signals.	L2	Understand
CO2	Apply standard digital signal processing tools to analyze speech signals in terms of their Time and frequency domain representations.	L3	Apply
CO3	Describe Linear Predictive analysis of speech signals and different pitch period estimation methods.	L2	Understand
CO4	Explain Homomorphic processing of speech signals and applications of speech processing, including speech enhancement.	L2	Understand
CO5	Describe applications of speech processing including speaker recognition and speech recognition.	L2	Understand

Speech Processing Laboratory (22PEET7045L)

List of Laboratory Experiments: (Any Eight)

1. To study the effects of sampling (aliasing) and quantization on speech signals by playing them at different sampling rates and bits per sample (upto 16 bps).
2. To study the time-varying nature of the speech signal in the time domain.
3. To study the varying nature of the speech signal in the frequency domain.
4. Short-Time Spectrum Analysis of Speech.
5. Spectrographic analysis of speech.
6. Cepstral analysis of speech.
7. Linear prediction analysis of speech.
8. Formant synthesis.
9. Analysis by synthesis of speech.
10. Dynamic Time Warping for Automatic Speech recognition.
11. Audio segmentation.
12. Audio Source separation.

Minimum eight experiments from the above suggested list or any other experiment based on syllabus to be included, which would help the learner to apply the concept learnt.

Text Books

1. Douglas O'Shaughnessy, "Speech Communications: Human Machine", University Press, 2nd Edition, 1999.
2. Rabiner and Schafer, "Digital Processing of Speech Signals", Prentice Hall, 3rd Edition, 1978.

Reference Books

1. Thomas F. Quatieri, "Discrete-Time Speech Signal Processing: Principles and Practice", Prentice Hall, 3rd Edition, 2001
2. Nelson Morgan and Ben Gold, "Speech and Audio Signal Processing: Processing and Perception of Speech and Music", John Wiley & Sons, 2nd Edition, 2011.
3. J. L. Flanagan, "Speech Analysis Synthesis and Perception", Springer-Verlag, 2nd Edition, 1972.
4. Gold Morgan, "Speech and Audio Signal Processing", Wiley and Sons 2nd Edition, 1999.
5. Dr. Shaila D. Apte, "Speech and Audio Processing", Wiley Precise Textbook, 1st Edition, 2015.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Embedded System (22PEET7046T)	
Embedded System Laboratory(22PEET7046L)	

Pre-requisite:

- Digital System Design
- Microcontroller Applications-I
- Microcontroller Applications- II

Course Objectives:

- To develop background knowledge of Embedded Systems.
- To understand Embedded Systems communication techniques.
- To write programs for Embedded Systems based applications.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the Embedded Systems design metrics and development life cycle.	L2	Understand
CO2	Describe various processor design techniques and architectures through relevant examples.	L2	Understand
CO3	Recognize and differentiate between communication types, buses, and protocols in Embedded Systems.	L4	Analyze
CO4	Illustrate the concepts and essential components of a Real Time Operating System.	L4	Analyze

Embedded System (22PEET7046T)

COURSE CONTENTS

Unit-I	Embedded System Overview	6 Hrs.
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Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Major Application Areas, Characteristics and quality attributes (Design Metric) of embedded system. Real time system's requirements, real time issues, interrupt latency. Embedded Product development life cycle.

Unit-II	Processor	9 Hrs.
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Overview of Custom Single-Purpose Processors, General-Purpose Processors, Standard Single-Purpose Processors, RISC and CISC architectures, GCD example.

Unit-III	Communication	9 Hrs.
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CAN bus, I2C, MOD bus, SPI, Examples on Parallel Communication, Serial Communication, Wireless Communication.

Unit-IV	Real Time Operating Systems (RTOS)	9 Hrs.
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Operating system basics, Types of OS, Tasks, Process, Threads, Multiprocessing and, Multi-tasking, Task scheduling, Task communications, Task synchronization, Device drivers, RTOS selection criterion, RTOS examples.

Unit-V	Design examples	9 Hrs.
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Requirements and specifications, Digital Camera, Automatic Chocolate Vending Machine, Adaptive Cruise Control in car.

Embedded System Laboratory(22PEET7046L)

List of Laboratory Experiments: (Any Eight)

1. Interfacing of I2C, CAN, and SPI with ARM controller.
2. Speed Control of DC Motor using ARM controller.
3. Interface humidity sensor to ARM controller and display it on LCD.
4. Interface temperature sensor to ARM controller and display it on LCD.
5. Simulation of multitasking using RTOS.
6. Simulation of mutex using RTOS.
7. Simulation of mailboxes using RTOS.
8. Inter process communication using semaphore in RTOS.
9. Simulation of message queues using RTOS.
10. Mini Project.

Text Books

1. Frank Vahid and Tony Givargis, Embedded System Design: A Unified Hardware/Software Introduction, Wiley Publication, 3ed Edition, 2006.
2. Raj Kamal, Embedded Systems: Architecture, Programming and Design, Tata McGraw Hill, 1st Edition, Pearson, 2003.
3. P. E. Allen and D. R. Holberg, CMOS Analog Circuit Design, Oxford University Press, 3rd Edition, Pearson, 2012.

Reference Books

1. David Simon, an Embedded Software Primer, Pearson Publication, 1st Edition, 2009.
2. K. V. Shibu, Introduction to Embedded Systems, 2nd Edition, 2017.
3. K.V.K. Prasad, Embedded Systems/Real-Time Systems: Concepts, Design and Programming, Dreamtech, 1st Edition, 2003.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Advanced VLSI Design (22PEET7047T)	
Advanced VLSI Design Laboratory (22PEET7047L)	

Pre-requisite:

- Electronic Circuit Design
- Integrated Circuits,
- Basic VLSI

Course Objectives:

- To highlight the circuit design issues in the context of Analog VLSI technology.
- To provide the understanding of different design styles.
- To provide an exposure to drawing layout of circuits.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe MOSFET operation and analyze small signal MOS models.	L4	Analyze
CO2	Design single stage amplifier based on MOSFET.	L6	Create
CO3	Design differential amplifier based on MOSFET.	L6	Create
CO4	Design the MOSFET-based operational amplifier.	L6	Create

Advanced VLSI Design (22PEET7047T)

COURSE CONTENTS

Unit-I	CMOS Analog building blocks	10 Hrs.
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MOS Models: Necessity of CMOS analog design, Review of characteristics of MOS device, MOS small signal model, MOS spice models. Passive and Active Current Mirrors: Basic current mirrors, Cascode current mirrors and Active current mirrors. Band Gap References: General Considerations, Supply-independent biasing, Temperature independent references, PTAT current generation and Constant Gm biasing.

Unit-II	Single Stage Amplifiers	10 Hrs.
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Configurations: Basic concepts, Common source stage, Source follower, Common gate stage, Cascade stage Frequency Response and Noise: General considerations, Common-source stage, Source followers, Common-gate stage, Cascode stage and Noise in single stage amplifier.

Unit-III	Differential Amplifiers	8 Hrs.
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Configurations: Single-Ended and Differential Operation, Basic Differential Pair, Common-Mode Response, Differential Pair with MOS Loads, Gilbert Cell. Frequency response and noise in differential Amplifiers: Differential pair with Passive Loads, Differential Pair with Active Loads.

Unit-IV	MOS Operational Amplifiers	8 Hrs.
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Op-amp Design: General Considerations, performance parameters, one stage op-amps, Two-stage op-amps, Gain Boosting, Common-mode feedback, input range limitations, Slew Rate, Power supply rejection, Noise in op-amps. Stability and Frequency Compensation: General Considerations, Multi pole systems, Phase margin, Frequency compensation.

Unit-V	Analog Layout and other concepts	6 Hrs.
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Analog Layout Techniques: Antenna effect, Resistor matching, capacitor matching, active device de- sign, current mirror matching, floor planning, shielding and guard rings.

Advanced VLSI Design Laboratory (22PEET7047L)

List of Laboratory Experiments: (Any 8)

1. To study trans-conductance plots of MOSFET device (voltage bias, current bias and technology bias).
2. To design of basic amplifier MOSFETs.
3. To design cascode amplifier.
4. To design basic current sink.
5. To design current sink by using negative feedback resistor.
6. To design cascode current sink.
7. To design of positive feedback boot strap current sink.
8. To design of regulated cascode current sink.
9. To design of simple current mirror.
10. To design Wilson current mirror.

Text Books

1. B Razavi, Design of Analog CMOS Integrated Circuits, Tata McGraw Hill, 1st Edition.
2. R. Jacob Baker, Harry W. Li, David E. Boyce, CMOS Circuit Design, Layout, and Stimulation, Wiley, Student Edition.
3. P. E. Allen and D. R. Holberg, CMOS Analog Circuit Design, Oxford University Press, 3rd Edition.

Reference Books

1. Mohammed Ismail and Terri Faiz Analog VLSI Signal and Information Process, McGraw-Hill Book company, 1994
2. John P. Uyemura, CMOS Logic Circuit Design 2001, Springer US
3. Gray, Meyer, Lewis, Hurst, "Analysis and design of Analog Integrated Circuits", Willey, 6th Edition, 2024.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Product Life Cycle Management (22OEET7051T)	

Prerequisite:

- Knowledge of basic concepts of Management.

Course Objectives

- To familiarize the students with the need, benefits and components of PLM.
- To acquaint students with Product Data Management and PLM strategies.
- To give insights into new product development program and guidelines for designing and developing a product.
- To familiarize the students with Virtual Product Development.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.	L2	Understand
CO2	Illustrate various approaches and techniques for designing and developing products.	L3	Apply
CO3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.	L3	Apply
CO4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant.	L3	Apply

Product Life Cycle Management (22OEET7051T)

COURSE CONTENTS

Unit-I Introduction to Product Lifecycle Management (PLM) 9 Hrs.

Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance and Benefits of PLM, Widespread Impact of PLM, Focus and Application.

A PLM Project, Starting the PLM Initiative, PLM Applications. PLM Strategies: Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM.

Unit-II Product Design 9 Hrs.

Product Design and Development Process, Engineering Design, Organization and De-composition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process.

Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process.

Unit-III Product Data Management (PDM) 9 Hrs.

Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation.

Virtual Product Development Tools: For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modelling and simulations in Product Design, Examples/Case studies.

Unit-IV Integration of Environmental Aspects in Product Design 8 Hrs.

Sustainable Development Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design.

Unit-V Life Cycle Assessment and Life Cycle Cost Analysis 7 Hrs.

Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards,

Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis.

Text Books:

1. John Stark, "Product Lifecycle Management: Paradigm for 21st Century Product Realization", Springer-Verlag, 2004, ISBN: 1852338105.
2. Fabio Giudice, Guido La Rosa, Antonino Risitano, "Product Design for the environment-A life cycle approach", Taylor and Francis, 2006.

Reference Books:

1. Saaksvuori Antti, Immonen Anselmie, "Product Life Cycle Management", Springer, Dreamtech, 2009, ISBN: 3540257314.
2. Michael Grieve, "Product Lifecycle Management: Driving the next generation of lean thinking", Tata McGraw Hill, 2006, ISBN: 0070636265.
3. François Villeneuve, Luc Mathieu, Max Giordano, "Product Life-Cycle Management: Geometric Variations", Wiley, 2010.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Management Information System (22OEET7052T)	

Prerequisite:

- Knowledge of basic concepts of Management.

Course Objectives

- The course is blend of Management and Technical field.
- To discuss the roles played by information technology in today's business and define various technology architectures on which information systems are built.
- To define and analyze typical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage.
- To identify the basic steps in systems development.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain how information systems Transform Business.	L2	Understand
CO2	Use information systems concepts to assess their effects on organizational operations.	L3	Apply
CO3	Describe IT infrastructure and its components and its current trends.	L2	Understand
CO4	Explain principal tools and technologies for accessing information from databases to improve business performance and decision making.	L2	Understand
CO5	Use enterprise-wide knowledge management systems to show their benefits for business operations.	L3	Apply

Management Information System (22OEET7052T)

COURSE CONTENTS

Unit-I **Foundation Concepts** **3 Hrs.**

Information Systems in Business, Functional Area Information System, The Components of Information Systems, Impact of IT on organizations and society, Organizational Strategy, Information systems for strategic advantage.

Unit-II **Information Technologies:** **7 Hrs.**

Hardware and Software, Computer Systems: End User and Enterprise Computing Computer Peripherals: Input, Output, and Storage Technologies Application Software: End User Applications, System Software: Technical Foundations of Database Management, Managing Data Re-sources, Big data, Data warehouse and Data Marts, Knowledge Management. Networks: The Networked Enterprise (Wired and wireless), Pervasive computing, Cloud Computing models.

Unit-III **MIS Tools and applications for Decision making** **8 Hrs.**

ERP and ERP support of Business Process Reengineering. Business intelligence (BI): Managers and Decision Making, BI for Data analysis and Visualization. Artificial Intelligence Technologies in Business

Unit-IV **Security and Ethical Challenges** **8 Hrs.**

Security and Ethical Challenges: Security, Ethical, and Societal Challenges of IT Security Management of Information Technology.

Unit-V **Social Computing (SC)** **8 Hrs.**

Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce – B2B B2C, Mobile commerce.

Unit-VI **Information System within Organization** **8 Hrs.**

Information System within Organization: Acquiring Information Systems and Applications: Various System development life cycle models. Enterprise and Global Management of Information Technology: Managing Information Technology, Managing Global IT.

Reference Books:

1. James A O'Brien, George M., Ramesh Behl, "Management Information Systems", 11th Edition, Tata McGraw Hill, 2019.
2. Kelly Rainer, Brad Prince, "Management Information Systems", 2nd Edition, Wiley, 2013.
3. K.C. Laudon and J.P. Laudon, "Management Information Systems: Managing the Digital Firm", 10th Edition, Prentice Hall, 2007.

4. D. Boddy, A. Boonstra, "Managing Information Systems: Strategy and Organization", Prentice Hall, 2008.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Operations Research (22OEET7053T)	

Prerequisite:

- Basic Knowledge of Algebra, Probability and Statistics

Course Objectives

- To formulate a real-world decision problem as a mathematical programming model.
- To learn the mathematical tools that are employed to solve mathematical programming models.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze real-world problems by converting them into Linear Programming Problems and analyzing the solutions obtained using the Simplex method or other	L4	Analyze
CO2	Apply appropriate algorithms to identify real-world problems as Transportation Problems and Assignment Problems and address decision problems	L3	Apply
CO3	Analyze time-varying decision situations and analyze them using the principles of dynamic programming in real-life situations	L4	Analyze
CO4	Apply queuing theory concepts to identify the reasons for formation of queues, classify various queuing systems, and use defined system parameters for decision making in real-life situations.	L3	Apply
CO5	Apply decision-making concepts to competitive situations and determine appropriate strategies for two-person zero-sum games.	L3	Apply
CO6	Apply the concept of simulation and Monte Carlo simulation techniques to systems such as inventory and queuing, and determine solutions for them.	L3	Apply
CO7	Apply the concept of replacement policy to determine the optimal replacement age.	L3	Apply

Text Books:

1. Sharma J. K., “Operations Research”, Trinity Press.
2. Gupta P. K., Hira D. S., “Operations Research”, S. Chand Limited.

Reference Books:

1. Taha, H. A., “Operations Research - An Introduction”, Pearson Education, 2022.
2. Ravindran A., Phillips D. T., and Solberg J. J., “Operations Research: Principles and Practice”, John Willey and Sons, 2009.
3. Hiller F. S., and Liebermann G. J., “Introduction to Operations Research”, Tata McGraw Hill, 2010.
4. Pradeep Prabhakar Pai, “Operations Research Principles and Practice”, Oxford University Press, 2012.
5. R. Panneerselvam, “Operations Research”, PHI Publications, 2nd Edition, 2016.
6. A. M. Natarajan, P. Balasubramani, A. Tamilarasi, “Operations Research”, Pearson Education, 2nd Edition, 2014.
7. Kanti Swarup, P. K. Gupta and Man Mohan, “Operations Research”, Sultan Chand and Sons, 2010.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Cyber Security and Laws (22OEET7054T)	

Prerequisite:

- Knowledge of basic concepts of security.

Course Objectives

- To understand and identify different types cybercrime and cyber offences.
- To recognized Indian IT Act 2008 and its latest amendments.
- To learn various types of security standards compliances.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the different types of cybercrime and security issues E Business.	L2	Understand
CO2	Analyze different types of cyber threats and techniques for security management.	L4	Analyze
CO3	Analyze the legal requirements and standards for cyber security in various countries to regulate cyberspace.	L4	Analyze
CO4	Explain the Information Technology Act and the legal framework of right to privacy, data security, and data protection.	L2	Understand

Cyber Security and Laws (22OEET7054T)

COURSE CONTENTS

Unit-I	Introduction to Cybercrime	10 Hrs.
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Cyber Crime, Cyber Law, Cyber Security, History of Cyber Crime, Hacking, Data Theft, Cyber Terrorism, Virus and Worm's, Email Bombing, Pornography, online gambling, Forgery, Web Defacements, Web Jacking, Illegal online Selling, Cyber Defamation, Software Piracy, Electronics/ Digital Signature, Phishing, Password Cracking, Key loggers and Spywares, Steganography, DoS and D DoS attacks, SQL Injection, Buffer Over Flow,, Phishing Identity Theft (ID Theft) ,How criminal plan the attacks, Social Engineering, Cyber stalking.

Unit-II	Cyber Threats Analysis	7 Hrs.
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Knowledge of Dynamic and Deliberate Targeting, Knowledge of Indications and Warning, Knowledge of Internal Tactics to Anticipate and/or, Emulate Threat Capabilities and Actions, Knowledge of Key Cyber Threat Actors and their Equities Knowledge of Specific Target Identifiers and Their Usage.

Unit-III	Electronic Business and Legal Issues	8 Hrs.
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Evolution and development in Ecommerce, Policy Frameworks for Secure Electronic Business, paper vs paper less contracts, E-Commerce models- B2B, B2C, E security. E-Payment Mechanism; Payment through card system, E-Cheque, E-Cash, E-Payment Threats and Protections, Security for E-Commerce.

Unit-IV	Indian IT Act	8 Hrs.
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Cyber Crime and Criminal Justice, Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments Security aspect in cyber-Law: The Contract Aspects in Cyber Law, The Security Aspect of Cyber Law, The Intellectual Property Aspect in Cyber Law, The Evidence Aspect in Cyber Law, The Criminal Aspect in Cyber Law.

Unit-V	Security Industries Standard Compliances	9 Hrs.
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IT Security v/s IT Compliance, Cyber Security Standards, critical security controls for cyber security, GRC (Governance, Risk Management, and Compliance), SOX, GLBA, HIPAA, ISO/IEC 27001, NIST Cyber Security Framework (CSF), PCI-DSS. OWASP Top Ten Project, GDPR (General Data Protection Regulation), NIST (National Institute of Standards and Technology), CIS Controls (Centre for Internet Security Controls)

Reference Books:

1. Nina Godbole, Sunit Belapure, "Cyber Security", Wiley India, 2011.
2. Suresh T. Vishwanathan, "The Indian Cyber Law", 3rd Edition, Bharat Law House, 2022.

3. “The Information Technology Act, 2000”, Bare Act- Professional Book Publishers, New Delhi, 2022.
4. Anup K. Ghosh, “E-Commerce Security and Privacy”, Springer Science and Business Media, 2012.
5. Izzat Alsmadi, “The NICE Cyber Security Framework Cyber Security Intelligence and Analytics”, 1st Edition, Springer, 2019.
6. Advocate Prashant Mali, “Cyber Law and Cyber Crimes”, 2nd Edition, Snow White Publications, 2015.
7. Nina Godbole, “Information Systems Security”, 2nd Edition, Wiley India, 2017.
8. Kenneth J. Knapp, “Cyber Security and Global Information Assurance”, Information Science Publishing, 2009.
9. William Stallings, “Cryptography and Network Security”, 8th Edition, Pearson Publication, 2023.

Web Resources:

1. The Information Technology ACT, 2008- TIFR: <https://www.tifrh.res.in>
2. A Compliance Primer for IT professional: <https://www.sans.org/reading-room/whitepapers/compliance/compliance-primer-professionals-33538>

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Personal Finance Management (22OEET7055T)	

Prerequisite:

- Basic Knowledge of Algebra, Probability and Statistics.

Course Objectives

- To create awareness and educate consumers on access to financial services.
- To make the students understand the basic concepts, definitions and terms related to direct taxation.
- To help the students compute the Goods and Service Tax (GST) payable by a supplier after considering the eligible input tax credit.
- To familiarise the students with microfinance for accelerating the expansion of local microbusinesses.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Use a framework for financial planning to understand the overall role finances play in his/her personal life.	L3	Apply
CO2	Calculate income from salaries, house property, business/profession, capital gains and income from other sources.	L3	Apply
CO3	Calculate the amount of CGST, SGST and IGST payable after considering the eligible input tax credit.	L3	Apply
CO4	Describe how Microfinance can help in financial inclusion.	L2	Understand

Personal Finance Management (22OEET7055T)

COURSE CONTENTS

Unit-I **7 Hrs.**

Overview of Indian Financial System: Characteristics, Components and Functions of Financial System. Financial Instruments and Financial Markets, Financial inclusion.

Introduction to Personal Finance: Person Financial Planning in Action, Money Management Skills, Taxes in Your Financial Plan, Savings and Payment Services. Consumer Credit: Advantages, Disadvantages, Sources and Costs.

Unit-II **8 Hrs.**

Personal Financial Management: Loans: Home, Car, Education, Personal, Loan against property and Jewel loan.

Insurance: Types of Insurance – ULIP and Term; Health and Disability Income Insurance, Life Insurance. Investment: Investing Basics and Evaluating Bonds, investing in Stocks and Investing in Mutual Funds, Planning for the Future.

Unit-III **9 Hrs.**

Income Tax Act Basics: Introduction to Income Tax Act, 1961. Heads of Income and Computation of Total Income and Tax Liability: Income and Computation of Total Income under various heads, Clubbing Provisions, set off and carry forward of Losses, Deductions, Assessment of Income and tax liability of different persons. Tax Management, Administrative Procedures and ICDS: TDS, TCS and Advance Tax Administrative Procedures, ICDS.

Unit-IV **9 Hrs.**

Goods and Services Tax: GST Constitutional framework of Indirect Taxes before GST (Taxation Powers of Union and State Government); Concept of VAT: Meaning, Variants and Methods; Major Defects in the structure of Indirect Taxes prior to GST; Rationale for GST; Structure of GST (SGST, CGST, UTGST and IGST); GST Council, GST Network, State Compensation Mechanism, Registration.

Levy and Collection of GST: Taxable event - “Supply” of Goods and Services; Place of Supply: Within state, Interstate, Import and Export; Time of supply: Valuation for GST - Valuation rules, taxability of reimbursement of expenses; Exemption from GST: Small supplies and Composition Scheme: Classification of Goods and Services.

Unit-V **9 Hrs.**

Introduction to Microfinance: Micro-Finance: Definitions, Scope and Assumptions, Types of Micro-finance, Customers of Microfinance, Credit Delivery Methodologies, SHG concept, origin, Formation and Operation of Self-Help Groups (SHGs).

Models in Microfinance: Joint Liability Groups (JLG), SHG Bank Linkage Model and

GRAMEEN Model: Achievements and Challenges.

Institutional Mechanism: Current Challenges for Microfinance, Microfinance Institutions (MFIs), Constraints and Governance Issues, Institutional Structure of Microfinance in India: NGO-MFIs, NBFC-MFIs, Co-operatives, Banks, Microfinance Networks and Associations; Demand and Supply of Microfinance Services in India, Impact assessment and social assessments of MFIs.

Reference Books:

1. Asha Singh, M.S. Gupta, "Banking and Financial Sector Reforms in India", Serials Publication, 2010.
2. M. S. Gupta and J. B. Singh, "Indian Banking Sector: Essays and Issues", 1st Edition, Serials Publication, 2016.
3. K.M. Bhattacharya O.P. Agarwal, "Basics of Banking and Finance", Himalaya Publishing House, 2018.
4. S. Subba Reddy, P. Raghu Ram, "Agricultural Finance and Management", Oxford and IBH Publishing, 2018.
5. Dr. Vasant Desai, "The Indian Financial System and Development", 4th Edition, Himalaya Publishing House, 2011.
6. Sanjay Kumar Satapathy, "Income Tax Management Simple Way of Tax Management, Tax Planning and Tax Saving", 2018.
7. Dr. R. K. Jain, "Direct Tax System Income Tax", SBPD Publications, 2020.
8. S K Mishra, "Simplified Approach to GST Goods and Services Tax", Educreation Publishing, 2018.
9. Todd A Watkins, "Introduction to Microfinance", World Scientific Publishing Company, 2020.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Energy Audit and Management (22OEET7056T)	

Prerequisite:

- Basic Knowledge of Social science and Current affairs.

Course Objectives

- To understand the importance of energy security for sustainable development and the fundamentals of energy conservation.
- To identify and describe the basic principles and methodologies adopted in energy audit of a utility.
- To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management.
- To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Identify and describe the present state of energy security and its importance.	L2	Understand
CO2	Identify and describe the basic principles and methodologies adopted in the energy audit of a utility.	L2	Understand
CO3	Describe the energy performance evaluation of some common electrical installations and identify energy-saving opportunities.	L2	Understand
CO4	Describe the energy performance evaluation of some common thermal installations and identify energy-saving opportunities.	L2	Understand
CO5	Analyze the data collected during performance evaluation and recommend energy-saving measures.	L4	Analyze

Energy Audit and Management (22OEET7056T)

COURSE CONTENTS

Unit-I **5 Hrs.**

Energy Scenario: Present Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy Security, Energy Conservation and its Importance, Energy Conservation Act- 2001 and its Features. Basics of Energy and its various forms, Material and Energy balance.

Unit-II **10 Hrs.**

Energy Audit: Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, matching energy use to requirement, maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution.

Elements of monitoring and targeting, Energy audit instruments. Technical and economic feasibility, Classification of energy conservation measures. Safety considerations during energy audit.

Financial analysis techniques: Simple payback period, NPV, Return on investment (ROI) Internal rate of return (IRR).

Unit-III **10 Hrs.**

Energy Management and Energy Conservation in Electrical System: Electricity billing, Electrical load management and maximum demand Control; Power factor improvement, Energy efficient equipment's and appliances, star ratings. Energy efficiency measures in lighting system.

Lighting control: Occupancy sensors, daylight integration, and use of intelligent controllers. Energy conservation opportunities in water pumps, compressor, fan and blower. industrial drives, induction motors, motor retrofitting, soft starters, variable speed drives.

Unit-IV **10 Hrs.**

Energy Management and Energy Conservation in Thermal Systems: Review of different thermal loads; Energy conservation opportunities in: Steam distribution system, Steam leakages, Steam trapping, Condensate and flash steam recovery system. Waste heat recovery, use of insulation- types and application. Energy conservation opportunities in: Boiler system. Refrigeration system and HVAC system.

Unit-V **7 Hrs.**

Energy conservation in Buildings: Energy Conservation Building Codes (ECBC): Green Building, LEED rating, Application of Non-Conventional and Renewable Energy Sources, Energy sources and energy management in electric vehicles.

Reference Books:

1. Geofry Stokes, "Handbook of Electrical Installation Practice", Blackwell Science, 2003.
2. Anil Valia, "Designing with light: Lighting Handbook", Lighting System.
3. W. C. Turner, "Energy Management Handbook", Fairmont Press, 5th Edition, 2004.
4. A. K. Tyagi, "Handbook on Energy Audits and Management", Tata Energy Research Institute, 2000.
5. C. B. Smith, "Energy Management Principles", Elsevier Science Publishing, 2nd Edition, 2015.
6. Dale R. Patrick, S. Fardo, Ray E. Richardson, "Energy Conservation Guidebook", Fairmont Press, 2nd Edition, 2007.
7. Albert Thumann, W. J. Younger, T. Niehus, "Handbook of Energy Audits", Fairmont Press, 6th Edition, 2010.

Web Resources:

1. www.energymanagertraining.com
2. www.bee-india.nic.in

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Public Systems and Policies (22OEET7057T)	

Prerequisite:

- Basic Knowledge of Social science and Current affairs.

Course Objectives

- To analyze the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.
- To understand public systems in a fast-changing environment in the global context.
- To provide an in-depth understanding of the ills prevailing in the society and aids to identify the solutions for them.
- To explain public policy and its operations with special focus on policy relating to Government finance.
- To analyze and evaluate the impact of the public policy on firms and economy at large.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the importance of public systems in a fast-changing environment in the global context.	L2	Understand
CO2	Analyze the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.	L4	Analyze
CO3	Explain public policy and its operations with special focus on policy relating to Government finance.	L2	Understand
CO4	Analyze the impact of public policy on firms and the economy at large and work under various fields as policymakers.	L4	Analyze
CO5	Apply analytical skills through Expenditure Policy in public services case studies.	L3	Apply

Public Systems and Policies (22OEET7057T)

COURSE CONTENTS

Unit-I **9 Hrs.**

Introduction and Overview of Public Systems: Ideology of Public Systems; Mechanistic and Organic view of Society and Individuals, The Legal Framework; Federal Government; State and Local Governments, Government growth; The size of Government.

Unit-II **6 Hrs.**

Public Sector in the Economics Accounts: Public Sector in the circular flow; Public Sector in the National Income Accounts.

Unit-III **7 Hrs.**

Public Choice and Fiscal Politics: Direct Democracy; Representative Democracy; The Allocation Function; The Distribution Function; The Stabilization Function; Coordination of Budget Functions; The Leviathan Hypothesis.

Unit-IV **11 Hrs.**

Introduction and Overview of Public Policy: Markets and Government; Social goods and Market failure, public expenditure and its evaluation; Cost Benefit Analysis, Public policy and Externalities, Taxation Policy and its impact, Income distribution, redistribution and social security issues Fiscal and Budgetary Policy, Fiscal Federalism in India.

Unit-V **9 Hrs.**

Case Studies in Expenditure Policy:

Public Services: A) National Defence B) Highways C) Outdoor Recreation D) Education.

Reference Books:

1. Introduction to Public Policy by Charles Wheelan, W.W. Norton and Company.
2. Understanding Public Policy by Thomas R. Dye, Prentice Hall.
3. Public Policy-Making: An Introduction by Anderson J.E., Boston, Houghton.
4. Public Administration by Avasthi and Maheshwari, Lakshminarayan Agarwal, Agra.
5. New Horizons of Public Administration by Bhattacharya, Mohit, Jawahar Publishers, New Delhi.
6. Public Administration and Public Affairs by Henry, Nicholas, Prentice Hall of India, New Delhi.
7. Public Finance 10th Edition by Harvey S Rosen and Ted Gayer, McGraw-Hill Education, 2013.
8. Public Finance in Theory and Practice by Musgrave and Musgrave.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Science of Well-being (22OEET7058T)	

Course Objectives

- To create consciousness about importance of holistic health and physical as well as mental well-being.
- To make learners aware of the concepts of Happiness, Gratitude, Self-Compassion, Empathy etc.
- To introduce the learners to the means of mental and physical well-being, ill effects of mal- practices like alcoholism, smoking etc.
- To equip the learners to manage and cope up with stress in their daily living.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe concepts of holistic health and well-being, differentiate between its true meaning and misconceptions, and explain the benefits of well-being.	L2	Understand
CO2	Describe the meaning of happiness, practice gratitude and self-compassion, and analyze incidents from one's own life	L4	Analyze
CO3	Explain the causes and effects of stress, identify reasons for stress in one's own surroundings and self.	L2	Understand
CO4	Describe the importance of physical health and fitness, assess one's lifestyle, and justify its limitations or effectiveness.	L5	Evaluate
CO5	Analyze one's own coping mechanisms, assess their effectiveness, develop and strategize for betterment, and execute them.	L4	Analyze

Science of Well-being (22OEET7058T)

COURSE CONTENTS

Unit-I **9 Hrs.**

Health and Well-being: The concept of health, dimensions of health, the notion of well-being, various facets of well-being, relation between health and well-being.

Concept of holistic health, its principles and importance, concept and benefits of holistic care, misconceptions about holistic health approach, the application of a true holistic approach to our well-being.

Unit-II **8 Hrs.**

Concepts of Happiness- Happiness: what is it and how do we measure it? Philosophical perspectives on happiness, Happiness: Nature or Nurture? Happiness in the modern world: impediments and accelerators, Narrow vs. Broad Band Approaches to Happiness, Benefits of Happiness, Self-Compassion and Gratitude. Misconceptions of happiness.

Unit-III **9 Hrs.**

Stress and Mental Health / Well-being: Nature and concept of stress, meaning and definitions of stress, types of stress, meaning of stressors, types of stressors, symptoms of stress, effects of stress, different models of stress.

Sources of stress and how does stress cause illness, various sources of stress, delineate between external and internal sources of stress, differentiate between continuous and discrete stressors, the effects of these stressors on health and well-being, diversity of stressors and their health consequences, relation between stress and illness from different perspectives association between stress related physiological mechanisms and different illnesses.

Unit-IV **8 Hrs.**

Physical Well-being / Health Management: Concept of health behaviours, dimensions of health behaviours. Health enhancing behaviours: Exercise and Weight control, application and importance of these health enhancing behaviours. Health protective behaviours and illness management: concept of illness management, effectiveness of illness management.

Concept of Nutrition, Role of Nutrition, Components of Nutrition, concept of Malnutrition, Health compromising behaviours: Alcoholism, Smoking and its effects on health.

Unit-V **8 Hrs.**

Dealing with Difficult Times / Coping mechanisms: The concept of chronic stress, Health and safety risks of chronic stress, Forms and Treatment of chronic stress, Coping with Acute and Chronic stress, theories of the stress-illness link, role of stress in mental disorders.

Concept of coping, Ways of coping and stress management, basic knowledge about stress management, various techniques of stress management, stress management programs. Mental

strengths and virtues, Hope, Optimism, Resilience - concept, pathways and models, Meditation and Self-introspection.

Text Books:

1. Felicia Huppert, Nick Baylis, Barry Keverne, "The Science of well-being", Oxford University Press, 2005.
2. S. Ojha, U. Rani Srivastava, Shobhna Joshi, "Health and Well-Being: Emerging Trends", Global Vision Publishing House, 2010.
3. Charles Richard Snyder, Shane, J. Lopez, Jennifer Teramoto Pedrotti, "Positive Psychology: The scientific and Practical Explorations of Human Strengths", 2nd Edition, Sage Publications, 2011.

Reference Books:

1. Kitayama S. and Markus H. R., "The Pursuit of Happiness and the Realization of Sympathy: Cultural Patterns of Self, Social Relations, and Well-being", Culture and subjective well-being, The MIT Press, 2000.
2. Dubos R., "Man Adapting New Haven", Yale University Press, 1980.
3. McMahon D. M., "Happiness a history", Atlantic Monthly Press, 2006.
4. D. Kahneman, E. Diener and N. Schwarz, "Well-being: The Foundations of Hedonic Psychology", Russell Sage Foundation, 1999.
5. Selye H., "The Stress of Life", McGraw-Hill, 1984.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Research Methodology (22OEET7059T)	

Prerequisite:

- Basic Knowledge of Probability and Statistics.

Course Objectives

- To understand Research and Research Process.
- To acquaint learners with identifying problems for research and develop research strategies.
- To familiarize learners with the techniques of data collection, analysis of data and interpretation.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply preliminary research design concepts for projects in their subject matter areas.	L3	Apply
CO2	Analyze and report research data using appropriate statistical and analytical techniques.	L4	Analyze
CO3	Explain complex data or situations clearly.	L2	Understand
CO4	Analyze the research findings.	L4	Analyze
CO5	Summarize a structured research report based on research findings.	L3	Apply

Research Methodology (22OEET7059T)

COURSE CONTENTS

Unit-I	Basic Research Concepts	7 Hrs.
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Basic Research Concepts: Meaning of research, Objectives of research, Types of research, Significance of research process.

Unit-II	Research Methodology	10 Hrs.
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Research Methodology: Identification of research problem, Literature review, Formulation of hypothesis, Formulation of Research design.

Unit-III	Research and Sample Design	10 Hrs.
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Research and Sample Design: Meaning of research and sample design, Need of research design, Features of good research design, Important concepts, Different research designs, Types of sampling designs.

Unit-IV	Data Collection and Data Analysis	10 Hrs.
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Data Collection and Data Analysis: Types of data, Methods for collecting data: Experiments and surveys, Collection of primary and secondary data, Hypothesis testing and interpretation of Data.

Unit-V	Interpretation and Report Writing	5 Hrs.
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Interpretation and Report Writing: Interpretation and drawing conclusions on the research, Preparation of the report, Ethical Issues.

Reference Books:

1. Dawson, Catherine, "Practical Research Methods", 1st Edition, UBS Publishers Distributors, 2002.
2. Kothari C. R., "Research Methodology- Methods and Techniques", 2nd Edition, Wiley Eastern Limited, 2004.
3. Kumar, Ranjit, "Research Methodology- A Step-by-Step Guide for Beginners", 3rd Edition, Pearson Education, 2010.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Industrial Automation Laboratory (22PCET7050L)	

Prerequisite:

- Basic Electrical and Electronics
- Digital System Design
- Control Systems
- Micro-processor and Microcontroller

Course Objectives:

- To learn Industrial automation and various systems.
- To learn Industrial automation techniques.
- To identify the differences between PLCs, SCADA, DCS.
- To provide the skills to install and trouble shoot Automation systems.
- To provide working experience in various programming techniques.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Identify various components and status indications of automation systems and PLCs used in industrial and daily life applications.	L2	Understand
CO2	Simulate input/output devices with appropriate PLC modules using ladder diagrams.	L4	Analyze
CO3	Develop and test ladder programs for a variety of automation applications using PLC simulation software.	L3	Apply
CO4	Design simple SCADA mimic diagram for basic industrial process monitoring.	L6	Create

Industrial Automation Laboratory (PCET7060L)

List of Laboratory Experiments: (Any Eight)

1. Develop/Execute ladder diagram using timer, counter, logical and arithmetic instructions.
2. Use PLC to control the devices, lamp, motor switches, sensors.
3. Measure Temperature of the given liquid using RTD or Thermocouple and PLC.
4. Design ladder diagram for Blink LEDs.
5. Design ladder diagram for sequential control of DC motor.
6. Develop and test ladder program for pulse counting using switch/ proximity sensor.
7. Use various functions of SCADA simulation editors to develop simple project.
8. Develop SCADA mimic diagram for water tank level control.
9. Industrial PC based control system.
10. Identify various automation systems available in different appliances/devices/machines in day-to-day use.
11. Identify various parts and front panel status indications of the given PLC.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Text Books

1. Petruzella F. D, Programmable Logic Controller, 4th Edition Tata McGraw Hill.
2. Mitra Madhuchandra, Sengupta, Programmable logic controller and industrial automation, 5th Edn, Penram International Publication.
3. Bhoyar S A, Supervisory control Data acquisition, 4th Edn, ISA Publication.

Reference Books

1. S.K. Singh, "Industrial Instrumentation and Control", 2nd Edition, Tata McGraw Hill, 2021.
2. Richard L. Shell, "Handbook of Industrial Automation", 1st Edition, CRC Press, 2000.
3. Bailey, David, "Practical SCADA for Industry", 1st Edition, Newness international publication, 2003.
4. Stenerson John, "Industrial Automation & Process Control", 1st Edition, Pearson publication, 2002.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Project Stage - II (PJET7060L)	

Course Objectives:

- Expose technical students to the industrial environment, allowing them to gain real-world experience and develop into competent professionals.
- Provide opportunities to learn and enhance the practical technical skills required for professional roles.
- Familiarize students with current technological developments relevant to their field of study.
- Encourage the application of technical knowledge in real industrial situations.
- Develop skills in writing technical reports and projects.
- Introduce students to the responsibilities and ethics of the engineering profession.
- Familiarize students with various materials, processes, and quality control practices.
- Promote academic, professional, and personal growth.
- Facilitate connections between students and potential future employers.
- Foster an understanding of the social, economic, and administrative factors influencing industrial organizations and their working environments.
- Develop an understanding of worker psychology, habits, attitudes, and problem-solving approaches.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze the problem statement and produce solution of the problem considering cultural, social, environmental and economic factors using appropriate tool and method.	L4	Analyze
CO2	Interpret project-based learning that allows students to transfer existing ideas into new applications.	L2	Understand
CO3	Apply the ability to work in teams and manage to conduct the project development activity.	L3	Apply
CO4	Use different perspectives from relevant disciplines which help them to get internships, jobs, and admission for higher studies.	L3	Apply
CO5	Explain the project development in the form of technical writing, and interpret what constitutes plagiarism and the	L2	Understand

Project Stage - II (PJET7060L)

COURSE CONTENTS

Syllabus:

- Project-I work done in VI semester shall be continued as Project-II in semester VII.
- Students should complete remaining implementation of ideas given in synopsis/Abstract of semester VII.
- Students / group must plan their execution of project, so that project work should be completed before end of semester.
- Project-II involves fabrication, design, experimentation, data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing, possible results and report writing.
- Each project group is required to maintain log book for documenting various activities of Project- II and submit group project report at the end of Semester-VII in the form of Hard bound.

Domain knowledge (any beyond) needed from the following areas for the effective implementation of the project:

Microcontroller and Embedded Systems, Signal Processing, Microwave and Antennas, Networking and Internet of Things, Data science and big data, Communication, Web and Application development, Robotics, AI and Machine learning. The above areas can be updated based on the technological innovations and development needed for specific project.

Guidelines:

The main purpose of this activity is to improve the students' technical skills, communication skills by integrating writing, presentation and teamwork opportunities.

- Each group will be reviewed twice in a semester and marks will be allotted based on the various points mentioned in the evaluation scheme.
- In the first review of this semester, each group is expected to complete 30 % of project.
- In the second review of this semester, each group is expected to complete 50 % of project.
- Interaction with alumni mentor will also be appreciated for the improvement of project.

Assessment Criteria:

- At the end of the semester, after confirmation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide).
- Assessment of the project stage I (at the end of the semester) will be done by the

departmental committee (including project guide).

- Oral examination should be conducted by Internal and External examiners. Students have to give presentation and demonstration based on their project.

Prescribed project report guidelines:

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction
- Literature Survey
- Related Theory
- Implementation details
- Project stage I Outcomes
- Conclusion
- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Table 1: Log Book Format

Sr. No	Week (Start Date: End Date)	Work Done	Sign of Guide	Sign of Coordinator
1				
2				

Table 2: Continuous Assessment Sheet

Sr No	Exam Seat No	Name of Student	Student Attendance	Log Book Maintain	Literature Review	Depth of Understanding	Report	Total
			5	5	5	5	5	25

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Table 3: Evaluation Sheet

Sr No	Exam Seat No	Name of Student	Project Selection	Design/ Simulation/ Logic	PCB/ hardware/ programming	Result Verification	Presentation	Total
			5	5	5	5	5	25

Each group will be reviewed twice in a semester by faculty guide and faculty coordinator based on the following criteria:

- Project progress
- Documentation/Technical paper writing
- Key findings

- Validation of results

Each review consists of 25 marks. Average of the marks scored in both the two reviews will be considered for final grading. The final certification and acceptance of TA ensures the satisfactory performance on the above aspects.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VII
Full Stack Development (22ESET7070L)	

Pre-requisite:

- Basic understanding of computers and web browsers
- Familiarity with basic programming concepts (variables, loops, functions, etc.)
- Introductory knowledge of HTML and CSS
- Basic understanding of JavaScript (optional but beneficial)

Course Objectives:

- To introduce students to the fundamentals of web development using HTML, CSS, and JavaScript.
- To provide in-depth knowledge of modern JavaScript (ES6+) features used in frontend development.
- To enable students to build interactive user interfaces using React and its component-based architecture.
- To develop skills in managing state, handling events, and using React Hooks for building dynamic applications.
- To empower learners to build and deploy real-world React projects including a personal portfolio.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Design responsive web pages using HTML5, CSS, and modern layout techniques.	L3	Apply
CO2	Apply core JavaScript and ES6+ features to build interactive web functionalities.	L3	Apply
CO3	Apply React concepts such as components, props, state, and event handling to develop dynamic user interfaces.	L3	Apply
CO4	Manage application state and side effects using React Hooks and advanced patterns.	L4	Analyze
CO5	Apply frontend development skills to build and deploy React-based projects and a personal portfolio.	L3	Apply

Full Stack Development (22ESET7070L)

COURSE CONTENTS

Learn React JS for Front-end development

ES6+ Features

- Let and Const (Replacing var)
- Arrow functions
- Promises (async / await)
- Spread / Rest operators
- Destructuring

JavaScript Functions

- Array Map Method
- JavaScript for Each Method
- JavaScript Filter () Method
- JavaScript Reduce Method

React Fundamentals

- About React
- About JSX in React
- Components in React
- Iteration in React
- Conditional Rendering
- Range Utility & styling in React

Working With State in React

- Event Handlers
- The use State Hook
- Forms in React
- Props Vs. State

React Hooks

- About Hooks
- Immutability Revisited & Refs
- Side Effects
- Custom hooks & Data Fetching
- Memorization

Project - Interactive Forms with Dynamic Tabs

- Project - The Job Application Form

Component API Design

- The Spectrum of Components
- Polymorphism & Compound Components
- React Context
- Understanding Modals

Portfolio Project

- Portfolio Website

Project - 2048 Game

- 2048 - Game

Advanced Patterns and Smarter State in React

- React State and Visual Updates
- Smarter Component Design in React
- Managing Complex State with use Reducer
- Advanced UI and Safe State Updates in React

Learn HTML / CSS

Introduction to HTML

- Introduction to HTML tags and structure
- List / Images / Links / Table using HTML
- Semantic HTML
- Quiz: HTML
- Project: HTML

Introduction to CSS

- Ways to style using CSS
- CSS selectors and properties
- CSS layout and positioning - Box model
- Quiz: CSS
- Project: CSS

Learn JavaScript

Output / Print in JavaScript

- Introducing output/printing
- Printing on multiple lines
- Print text and numbers using single print

Variables and datatypes

- Introduction to variables and datatypes
- Quiz on variables

- Boolean data type and negative numbers

Strings

- Introduction to strings
- Quiz on strings

Functions in JavaScript

- Learn about functions
- Use functions in problems

Conditional statements

- Intro to if / else
- Quiz on conditions
- Combining conditions - And / or

Debug your code

- Learn to debug common errors
- Practice debugging

Arrays

- Introduction to arrays
- Quiz on Arrays

Loops

- While loops
- For loops
- Quiz on loops
- Break / continue

ES6+ Features in JavaScript

- Introduction to let and const
- Arrow Functions
- Spread and Rest Operators
- Destructuring in JavaScript

User Inputs

- How to take user input
- Practice problems

Getting started with algorithmic problems

- What are test cases?
- What are custom inputs?
- Review problems

Full Stack Development (22ESET7070L)

Experiment list for Full Stack Web Development

1. Creation of HTML Skeleton
2. Creation of a Paragraph in HTML
3. Add the elements in HTML - images and videos. Links to external websites, create lists, Add tables
4. Use semantic HTML
5. Do inline styling in CSS
6. Create a style sheet in CSS - internal and external
7. Use class / ID selector in CSS
8. do font staying in CSS
9. do layout and positioning in CSS
10. Printing a number/text in JS
11. Arithmetic Operations in JS
12. Inserting text Between Outputs in JS
13. Create and Declare Variables in JS
14. Use of String datatype/Float Datatype
15. Create a Boolean variable
16. Use a function in JS
17. Call a function within a function
18. Render Dynamic Data in JSX
19. Do Inline Styles in JSX
20. Update the given React component to display dynamic values and additional information inside the <div> in React
21. Create a basic react component in React
22. Create flexible and reusable components in React
23. Create a component with an input field and two buttons in React
24. Interact with DOM elements and handle side effects in React using useRef and use Effect
25. Handle Form Submissions with Fetch in React

Text Book

1. A. Banks and E. Porcello, Learning React: Modern Patterns for Developing React Apps, 3rd ed. Sebastopol, CA, USA: O'Reilly Media, 2020.

Reference Books

1. S. Stefanov, react – Up & Running: Building Web Applications, Sebastopol, CA, USA: O'Reilly Media, 2016.

2. A. Accomazzo, N. Murray, A. Lerner, C. Blank, and D. Gallo, Fullstack React: The Complete Guide to ReactJS and Friends, San Francisco, CA, USA: Fullstack.io, 2017.
3. D. Crockford, JavaScript: The Good Parts, Sebastopol, CA, USA: O'Reilly Media, 2008.
4. M. Haverbeke, Eloquent JavaScript: A Modern Introduction to Programming, 3rd ed. San Francisco, CA, USA: No Starch Press, 2018.
5. J. Duckett, HTML and CSS: Design and Build Websites, Indianapolis, IN, USA: Wiley, 2011.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
5G Technology (22PEET8011T)	

Pre-requisite:

- Analog Communication
- Digital Communication
- Computer Networks
- Mobile Communication

Course Objectives:

- To learn the Basics of 5G and Beyond Wireless communication
- To provide a basic understanding of the key technologies and modulation techniques of 5G
- To study architecture of 5G.
- To develop the concepts of spectrum requirements, MIMO, antennas for 5G.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the basics of 5G and beyond communication.	L2	Understand
CO2	Characterize and analyze various modulation and multiplexing techniques used in 5G.	L4	Analyze
CO3	Elaborate system architecture of 5G technology.	L2	Understand
CO4	Illustrate spectrum requirement, antenna design and radio propagation for 5G technology.	L2	Understand
CO5	Design security architecture of 5G.	L6	Create

5G Technology (22PEET8011T)

COURSE CONTENTS

Unit-I Introduction 9 Hrs.

Introduction – Historical trend of wireless communication – Evolution of LTE Technology to Beyond 4G.THE 5G INTERNET – Internet of Things and context – Awareness – Network Reconfiguration and Virtualization support – Mobility – quality of Service Control – Emerging approach for resource over provisioning the 5G radio-access technologies-OFDMA, NOMA, SCMA, IDMA

Unit-II Architecture of the Core Network 10 Hrs.

The Evolved Packet Core - Release 8 Architecture. Control and User Plane Separation The 5G Core Network- Representation Using Reference Points, Representation Using Service-based Interfaces, Data Transport, Roaming Architectures, Data Storage Architectures, Non-3GPP Access to the 5G Core. Network Areas, Slices and Identities-Signaling Protocol.

Unit-III Architecture of the Radio Access Network 9 Hrs.

The Evolved UMTS Terrestrial Radio Access Network – 3GPP Architecture, Carrier Aggregation, Dual Connectivity the Next-generation Node B - High Level Architecture, Internal Architecture and Deployment Options. Network Areas and Identities - Tracking Areas, RAN Areas, Cell Identities. Signalling Protocols - Signalling Protocol Architecture, Signalling Radio Bearers

Unit-IV MIMO Systems and Communication Devices 6 Hrs.

Introduction, MIMO in LTE, Theoretical background, Single user MIMO, Multi-user MIMO, Capacity of massive MIMO: a summary, Fundamentals of baseband and RF implementations in massive MIMO.

Device To Device D2D Communication – D2D: from 4G to 5G – Radio resource management for mobile brand D2D

Unit-V Spectrum, Antennas and Radio Propagation 8 Hrs.

Spectrum - Spectrum landscape and requirements, Spectrum Allocations for 5G, Bandwidth requirements, Spectrum access modes and sharing scenarios, Spectrum technologies-Spectrum toolbox, Main technology component.

Antennas - Antennas and Propagation, Antenna Gain Radio Propagation - Radio Propagation Issues for Millimetre Waves, Diffraction and Reflection, Penetration Losses, Foliage Losses, Atmospheric Losses , Multipath, Fading and Coherence

Text Books

1. Christopher Cox, Chris Cox, “An Introduction to 5G: The New Radio, 5G Network and Beyond”, John Wiley & Sons Ltd, 1st Edition, 2020.
2. Afif Osseiran, Jose F. Monserrat, Patrick Marsch, “5G Mobile and Wireless Communications Technology”, 4th Edition Pearson, 2021.

Reference Books

1. Raj Kamal, Internet of Things Architecture and Design Principles, 2017, McGraw Hill Education (India) Private Limited.
2. Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, 2015, Wiley publication.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
Computer Vision (22PEET8012T)	

Pre-requisite:

- Fundamentals of Digital Image Processing

Course Objectives:

- Review of image acquisition, enhancement, filtering, and transformations in spatial and frequency domains.
- Develop an understanding of feature extraction methods (e.g., edges, corners, SIFT, HOG) and their applications in image analysis and pattern recognition.
- Learn algorithms for object detection, segmentation, and classification using traditional methods and machine learning approaches.
- Understand 3D reconstruction, stereo vision, and depth estimation techniques used for scene understanding.
- Explore methods for motion detection, tracking, and optical flow estimation in videos and dynamic environments.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the principles of image pre-processing, feature extraction, and object recognition Techniques.	L2	Understand
CO2	Extract and utilize advanced features (e.g., SIFT, SURF, or learned embedding) for specific tasks like tissue differentiation in medical images or lane detection in autonomous driving.	L3	Apply
CO3	Explain 3D reconstruction, stereo vision, and depth estimation techniques used for scene understanding.	L2	Understand
CO4	Develop solutions for tracking moving objects using motion analysis techniques like optical flow.	L6	Create

Computer Vision (22PEET8012T)

COURSE CONTENTS

Unit-I **Fundamentals of Image Formation, Transformation** **8 Hrs.**

Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Histogram Processing.

Unit-II **Feature Extraction and Matching** **10 Hrs.**

Canny edge detector, Harris corner detector. Hessian, LOG, DOG, HOG, Line detectors (Hough Transform) Descriptors and Key points: SIFT, SURF.

Unit-III **Camera Calibration, Depth from Stereo** **06 Hrs.**

Use stereo image pairs to estimate depth using disparity maps. 3D Reconstruction: Reconstruct a 3D scene from multiple 2D images using Structure from Motion (SfM).

Unit-IV **Introduction to Machine Learning for Image Classification** **10 Hrs.**

Object Detection, Semantic Segmentation. Convolutional Neural Networks (CNNs) Build and train a simple CNN for image classification using frameworks like TensorFlow or PyTorch. Object Segmentation with Deep Learning Implement semantic segmentation using UNet or Mask R-CNN. Transfer Learning: Fine-tune a pre-trained model (e.g., ResNet or Mobile Net) for a custom dataset.

Unit-V **Optical Flow** **8 Hrs.**

Horn and Shunck method: algorithm using discrete formulation, steps of Jacobi's method for matrix inversion, Lucas-Kanade algorithm for optical flow, Comparison of Horn-Shunck and Lucas-Kanade algorithms. Applications of optical flow.

Text Books

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2nd Edition, 2022.
2. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 4th Edition Pearson, 2021.
3. David A. Forsyth and Jean Ponce, "Computer Vision – A Modern Approach", PHI Learning, 2nd Edition, 2009.

Reference Books

1. Gary Bradski and Adrian Kaehler, "Learning OpenCV", O'Reilly Media, 2nd Edition, Inc, 2008.
2. Adrian Rosebrock, "Deep Learning for Computer Vision with Python", 1st Edition, 2017.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
Satellite Communication (22PEET8013T)	

Pre-requisite:

- Analog Communication
- Digital Communication

Course Objectives:

- To understand the basics of satellite communications and different satellite communication or bits.
- Provide an in-depth understanding of satellite communication system operation, launching techniques, satellite link design and earth station technology.
- To explain the tools necessary for the calculation of basic parameters in a satellite communication system.
- Review the state of the art in new research areas such as satellite networking, satellite personal. Communications, mobile satellite communication, Laser satellite.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the fundamentals of satellite communication systems, orbital mechanics, wave propagation, and launching techniques.	L2	Understand
CO2	Apply the concepts of satellite subsystems and stabilization techniques in the space segment.	L3	Apply
CO3	Apply design considerations and working principles of earth station components including antenna, tracking system, LNA, and HPA.	L3	Apply
CO4	Analyze satellite link parameters including link budget, noise, C/N ratio, uplink and downlink performance under various losses and conditions.	L4	Analyze
CO5	Apply multiple access techniques and satellite applications such as VSAT, TDMA, FDMA, CDMA, and optical satellite communication systems.	L3	Apply

Satellite Communication (22PEET8013T)

COURSE CONTENTS

Unit-I Overview of Satellite Systems, Orbits and Launching 8 Hrs.

Frequency allocation for satellite communication, Polar orbiting satellites, Kepler 's Laws, orbital parameters, orbital perturbations, effects of a non-spherical earth, atmospheric drag. Wave Propagation Polarization, Atmospheric Losses, Ionospheric Effects, Rain Attenuation, Antenna Polarization, Polarization of Satellite signals. Sub-satellite Point, predicting satellite position, antenna look angels, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage. Selection of launching site, launch window, launch vehicles; satellite launch vehicle (SLV), augmented satellite launch vehicle (ASLV), polar SLV, geostationary satellite launch vehicle (GSLV).

Unit-II Space Segment 8 Hrs.

Satellite subsystems: Transponder sub-system, Antenna subsystem, AOC Sub-system, TTC Sub- system, power sub-system, Thermal sub-system, reliability and quality Assurance. Satellite stabilization, stabilization techniques.

Unit-III Earth station 8 Hrs.

Design consideration, General configuration- Block diagram, receive only type earth, transmit-receive type earth station. Antenna system, Feed system, Tracking system, LNA, HPA.

Unit-IV Satellite Link 10 Hrs.

Isotropic radiated power, transmission losses, free-space transmission, feeder losses, antenna misalignment losses, fixed atmospheric and ionospheric losses, link power budget. System noise, antenna noise, amplifier noise temperature, amplifiers in cascade, noise factor, noise temperature of absorptive networks, overall system noise temperature, carrier to noise ratio. Uplink: Saturation flux density, input back off, earth station HPA, Downlink: Output back off, satellite TWTA output. Effects of rain, uplink rain-fade margin, downlink rain-fade margin, combined uplink and downlink C/N ratio, inter-modulation noise.

Unit-V The Space Segment Access and Utilization 8 Hrs.

Space segment access methods, pre-assigned FDMA, demand assigned FDMA, SPADE system. Code Division Multiple Access: Direct-sequence spread spectrum– acquisition and tracking TDMA: Reference Burst; Preamble and Post amble, carrier recovery, frame efficiency, channel capacity, preassigned TDMA, demand assigned TDMA. Satellite Applications: VSAT systems: Advantages, configurations, frequency bands, Television broadcast systems, DAB, Laser Satellite Communication: Link analysis, optical satellite link

transmitter, optical satellite link receiver, satellite beam acquisition, tracking positioning, deep space optical communication link.

Text Books

1. Dennis Roddy, "Satellite Communications", Mc. Graw-Hill International, 4th Edition, 2019.
2. M. Richharia, "Satellite Communication Systems Design Principles", Macmillan Press Ltd, 2nd Edition, 2003.
3. R. N. Mutangi, "Satellite Communication", Oxford university press, 1st, Edition, 2016.
4. Gerard Maral and Michel Bousquet, "Satellite Communication Systems", Wiley Publication, 4th, Edition, 2018.

Reference Books

1. Gerard Maral, "VSAT Networks", John Willy Sons, 2nd Edition, 2004.
2. Timothy Pratt, Charles Bostian, and Jeremy Allmuti, Satellite Communications, 1st Edn, John Willy Sons.
3. Wilbur L. Pritchard, Henri G. Suyderehoud, and Robert A. Nelson, Satellite Communication Systems Engineering, 2nd Edn, Pearson Publication.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
Internet Engineering & Network Security (22PEET8014T)	

Pre-requisite:

- Computer Networks

Course Objectives:

- To understand on Internet protocol, standards, services and administration.
- To discuss voice over IP as a real-time interactive audio/video service.
- To introduce various techniques to implement security mechanisms for network and cyber security.
- To discuss security implications on Organizations with the help of Risk Management and Incident preparation.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze application layer protocols to understand their role and functionality in Internet-based communication services	L4	Analyze
CO2	Analyze network layer services and advanced protocols to support efficient and scalable network designing.	L4	Analyze
CO3	Evaluate audio and video digitization and compression mechanisms and their effectiveness for real-time interactive multimedia services such as Voice over IP.	L5	Evaluate
CO4	Analyze network security fundamentals, IPSec mechanisms, and web security protocols for secure data transmission.	L4	Analyze
CO5	Describe security mechanisms and solutions used to protect modern network infrastructures.	L2	Understand

Internet Engineering & Network Security (22PEET8014T)

COURSE CONTENTS

Unit-I Introduction to Internet and Application layer protocols 8 Hrs.

What is the Internet, Evolution of the Internet, Review of TCP IP layer functions Application Layer protocols: HTTP, DHCP, DNS, FTP, TFTP, SMTP, MIME, IMAP, POP3, TELNET, SSH

Unit-II Network Layer 4 Hrs.

IPv6, Packet format, Transition from IPv4 to IPv6, ICMP (v4 and v6) Review of IP addresses, Special addresses, NAT, CIDR: Address aggregation

Unit-III Multimedia Communication 8 Hrs.

Digitizing audio and video, Audio Compression, video compression, streaming stored audio / video Characteristics of real time interactive audio/video, RTP, RTP Packet format, UDP Port, RTCP, RTCP messages VOIP: SIP, H.323 Flow characteristics, Flow classes, techniques to improve QoS, resource reservation, admission control

Unit-IV Security in Networks 10 Hrs.

Introduction to Information Security, Network Security Domains, Attacks and Their classification, Security services and mechanisms Network security basics, Overview of IP Security (IPSec), IP Security Architecture, Modes of Operation, Security Associations (SA), Authentication Header (AH), Encapsulating Security Payload (ESP), Internet Key Exchange. Web Security Requirements, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Unit-V Firewalls and IDS 6 Hrs.

Designing and Configuring Firewall Systems, Firewall Components Firewalls – Types, Comparison of Firewall Types, Firewall Configurations. Installing and Configuring FW, Proxy Server, Honey pot, Digital Immune System.

Unit-VI System security and case study 6 Hrs.

Signature verification, Finger print recognition, Voice recognition, Iris Recognition system. Security Operations Centre (SOC), Network Operations Centre (NOC), Network Security Audit Cloud Security. Wi-Fi Security, Mobile and Cellular Security.

Text Books

1. B. Forouzan, "TCP/IP Protocol Suite", McGraw Hill Publication, 4th Edition, 2009.
2. B. Forouzan, "Cryptography and Network Security", McGraw Hill Publications, 2nd Edition, 2010.
3. Nina Godbole, "Cyber Security", John Wiley Publications, 1st Edition 2011.

Reference Books

1. Leon Garcia, "Communication Networks", McGraw-Hill Publication, 2nd Edition, 2004.
2. Kurose and Ross, "Computer Networking", Pearson Publication, 5th Edition, 2012.
3. Pfleeger and Pfleeger, "Security in Computing", Pearson Publications, 5th Edition, 2011. Prepared by

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
Machine Learning for Signal Processing (22PEET8021T)	

Pre-requisite:

- Digital Signal Processing
- Engineering Mathematics - IV

Course Objectives:

- Introduce students to the fundamentals of machine learning (ML) techniques useful for various signal processing applications.
- To discuss various mathematical methods and algorithms involved in ML for Signal Processing.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe key concepts in linear algebra, probability theory and fundamentals relevant to machine learning for Signal Processing.	L2	Understand
CO2	Explain theoretical foundations of linear, non-linear models, and the principles behind probabilistic and advanced Signal Processing models.	L2	Understand
CO3	Apply various machine learning and Signal Processing algorithms and techniques, in problem solving.	L3	Apply
CO4	Analyze the performance and suitability of different learning techniques for specific tasks such as time series analysis, speech recognition, and image processing.	L4	Analyze

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
Advanced Digital Signal Processing (22PEET8022T)	

Pre-requisite:

- Engineering Mathematics – III.
- Engineering Mathematics – IV.
- Signals & Systems.
- Digital Signal Processing.

Course Objectives:

- To understand the effect of hardware limitations on performance of digital filters.
- To understand the concept of multirate signal processing.
- To understand linear prediction and optimum linear filtering.
- To understand Adaptive Filtering and Wavelet.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze the effect of hardware limitations on performance of digital filters.	L4	Analyze
CO2	Implement multistage sampling rate conversion.	L3	Apply
CO3	Analyze linear prediction methods and optimum linear filters.	L4	Analyze
CO4	Implement adaptive filters for given applications.	L3	Apply
CO5	Analyze wavelet theory for various applications.	L4	Analyze

3. Tarun Kumar Rawat, "Digital Signal Processing," Oxford University Press, 1st Edition, 2015.
4. Simon Haykin, "Adaptive Filter Theory," Pearson Education, 5th Edition, 2014.
5. P. P. Vaidyanathan, "Multirate Systems and Filter Banks", Pearson Education, 2nd Edition, 2008.
6. Raghuveer M. Rao and Ajit S. Bopardikar, "Wavelet Transforms- Introduction to Theory and Applications," Pearson Education Asia, 1st Edition, 2nd Impression, 2008

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
Microwave Amplifier & Oscillator Design (22PEET8023T)	

Pre-requisite:

- Electromagnetic and Wave Propagation
- Analog Communication
- Radio Frequency Circuit Design
- Radiating Systems
- Microwave Engineering

Course Objectives:

- To understand basics of microstrip lines and coupled lines
- To understand the concept of Microwave Amplifier design.
- To understand the concept of Microwave Oscillator design.
- To understand design and operation of printed microwave circuits and related concepts.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain design concepts of microstrip lines.	L2	Understand
CO2	Design microwave amplifier and analyze its functioning.	L6	Create
CO3	Design and analyze microwave oscillator and understand design concepts of mixers.	L6	Create
CO4	Describe various microwave system components like power dividers, directional couplers and attenuators.	L2	Understand
CO5	Describe concepts of EMI and EMC techniques for microwave systems.	L2	Understand

Microwave Amplifier & Oscillator Design (22PEET8023T)

COURSE CONTENTS

Unit-I	Microstrip Lines and Coupled Line Propagation	10 Hrs.
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Microstrip Lines: Planar wave guides, Microstrip field configurations, Microstrip transitions and microstrip measurements, non-TEM propagation, line impedance. Microstrip Discontinuities: Microstrip open circuits and gaps, micro strip corners, step change in width, microstrip-T junction, bends and microstrip cross junctions. Co-planar Lines: Co-planar waveguides, co-planar strips and co-planar transitions. Coupled Microstrip Lines: Analysis of coupled lines, wave equations for coupled lines, propagation models and coupled line parameters.

Unit-II	Microwave Amplifier Design	10 Hrs.
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Introduction: Definitions of Two-Port Power gains, derivation of power gains, stability circles, Test for unconditional stability. Single-Stage Transistor Amplifier Design: Maximum gain amplifier design (Conjugate Matching), constant-gain circles, Specific gain amplifier design and Low noise amplifier design. Broadband Transistor Amplifier Design: Balanced amplifier, Distributed amplifiers, differential amplifiers. Power Amplifiers: Characteristics of power amplifiers, Design of class A power amplifiers.

Unit-III	Oscillators and Mixers	9 Hrs.
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Oscillator Design: One-port and two-port microwave oscillator design, dielectric resonator oscillator design. Oscillator Phase Noise: Analysis of phase noise in oscillators. Mixers: Characteristics, Various types of Mixers: Single ended diode mixers, FET mixers, Balanced mixers, Image reject mixers and other types of mixers.

Unit-IV	Power Dividers, Directional Couplers, Attenuators	7 Hrs.
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Power Dividers: Two-way, Three-way and Four-way Equal Power Dividers, Unequal, Broadband and Compact Power Dividers. Directional Couplers: Coupled Line Directional Couplers, Branch Line Couplers, and Rat Race Coupler. Attenuators: Fixed and Variable Attenuators.

Unit-V	Microwave Systems and EMI, EMC Techniques	6 Hrs.
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Microwave Systems: RF Harvesting System, High Power Microwave System, Microwave Imaging System. EMI Sources: Natural sources of EMI, EMI from Circuits, apparatus and open site test area. Radiated and conducted EMI measurements. EMC Techniques: Grounding, shielding, bonding, shielding and EMI filters, cables, connectors, components and EMC Standards.

Text Books

1. K.C. Gupta et.al. "Microstrip Lines and Sotlines" Artech House, 2nd Edition, 1996.
2. D. Pozar, "Microwave Engineering", Wiley Publication, 4th Edition, 2015.
3. R. Ludwig R. & G. Bogdanov, "RF Circuit Design", Pearson Education Inc. 2nd Edition, 2009.
4. W. Prasad Kodali, "Engineering Electromagnetic Compatibility: Principles, Measurements, Technologies, and Computer Models", Wiley-IEEE Press, 2nd Edition, 2001

Reference Books

1. G. Gonzalez," Microwave Transistor Amplifiers Analysis and Design"Prentice Hall, 2nd Edition, 1997.
2. M. L. Sisodia & G. S. Raghuvanshi, "Microwave Circuits and Passive Devices", John Wiley & Sons, 3rd Edition, 1987.
3. Clayton R. Paul, "Electromagnetic Compatibility", John Wiley & Sons, 2nd Edition, 2006.

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
Internship(22INTET8030L)	

Course Objectives:

- To get exposure of industrial ecosystem.
- To enhance student's knowledge in the particular technology.
- To nurture student's leadership ability and responsibility to perform or execute the given task individually or in team.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply theoretical knowledge to real-world engineering problems through hands-on experience in industry or field settings.	L3	Apply
CO2	Apply technical knowledge and problem-solving approaches to address complex engineering problems in an industrial environment.	L3	Apply
CO3	Analyze organizational structures, workflows, and technologies to understand industry practices and operational challenges.	L4	Analyze
CO4	Develop technical documentation, reports, and presentations reflecting experiential learning and problem-solving approaches.	L6	Create
CO5	Discuss career goals and identify areas for personal and professional development based on internship exposure.	L2	Understand

GUIDELINES

Internships offer valuable educational and career development opportunities by providing students with practical experience in their field of study. In Semester – VIII, students have two options for their internship: Industry Internship and In-house Internship.

A. Industry Internship

Objectives: The industry internship aims to achieve the following objectives

1. Expose technical students to the industrial environment, allowing them to gain real-world experience and develop into competent professionals.
2. Provide opportunities to learn and enhance the practical technical skills required for professional roles.
3. Familiarize students with current technological developments relevant to their field of study.
4. Encourage the application of technical knowledge in real industrial situations.
5. Develop skills in writing technical reports and projects.
6. Introduce students to the responsibilities and ethics of the engineering profession.
7. Familiarize students with various materials, processes, products, and quality control practices.
8. Promote academic, professional, and personal growth.
9. Facilitate connections between students and potential future employers.
10. Foster an understanding of the social, economic, and administrative factors influencing industrial organizations and their working environments.
11. Develop an understanding of worker psychology, habits, attitudes, and problem-solving approaches.

Industry Internship Guidelines:

The Training and Placement (T&P) cell of the institute will arrange internships for students in industries/organizations after the seventh semester.

Students are expected to accept internship offers regardless of the company, job profile, location, or stipend offered.

Alternatively, students can individually apply by submitting “Student Internship Program Application” (available on Institute Website) for industry internships, adhering to the prescribed guidelines as follows:

1. Only T&P department granted internship will be considered.
2. The internship duration should be of minimum 12 Weeks.
3. Each student needs to take prior permission from T&P department before proceeding for any internship opportunity on his/her own.

4. Each student will be monitored twice (virtually/through online meetings) during the internship period in the presence of an industry mentor and the departmental faculty mentor and the concerned TPC.
5. If any student wants to withdraw from the Internship, he/she can only be allowed within two weeks of joining the same. Such students will have to continue the semester VIII academic activities regularly along with In-house internship.

Expected Activity in Industry Internship

Students may choose either to work on innovation or entrepreneurial activities resulting in start-ups or undergo internship with Industry/NGO/ Government organizations/Micro/ Small/ Medium enterprises to make themselves ready for the industry.

Every student is required to prepare a file containing documentary proofs of the activities done by him / her. The evaluation of these activities will be done twice (virtually/through online meetings) during the internship period by the committee constituted by the Head of the Department which shall include an industry mentor, faculty mentor and Department TP Coordinator (TPC). The assessment criteria for continuous assessment are as per Table 1.

Table 1: Continuous Assessment for Industry Internship

Internship Objectives and Goals	Internship Experience Skills Gained/Enhanced	Professional Development and Growth	Internship Report	Presentation
(30 Marks)	(30 Marks)	(30 Marks)	(30 Marks)	(30 Marks)

The ESE will be jointly evaluated by an industry mentor, faculty member and department T&P coordinator (TPC). The evaluation criteria are as per Table 2.

Table 2: Evaluation Criteria of Industry Internship

Internship Objectives and Goals	Internship Experience Skills Gained/Enhanced	Professional Development and Growth	Internship Report	Presentation
(30 Marks)	(30 Marks)	(30 Marks)	(30 Marks)	(30 Marks)

Industry Internship Report:

Upon completion of the internship, students should prepare a comprehensive report that reflects their observations and learnings during the training period. Students can consult their Industrial Supervisor, Faculty Mentor, or T & P Officer for guidance on selecting special topics and problems for the report.

The internship report will be evaluated based on the following criteria:

- I. Adequacy and purposeful write-up.
- II. Variety and relevance of learning experiences.

III. Practical applications and connections with the fundamental theories and concepts covered in the course (semester I to VII).

B. In-house Internship:

The in-house internship provides students with research-oriented opportunities to cultivate a research mindset. It serves as an extension of the project completed in VI and VII semesters (Project Stage-I & II) or offers new objectives provided by the department or research guide.

1. The in-house internship can be pursued individually or as a group activity.
2. If extending a project from Stage II, at least one student in the group must have participated in Stage I & II.
3. If working on the topic offered by the department or in-house mentor, a group of fresh students can form a team.
4. The maximum group size is limited to four students.
5. In case of extension of project stage II, the outcomes should be in the form of product development/technology transfer along with patent and copyright / one research publication (UGC care listed journal/conference). Students can work jointly with any government funding agency or industry. In such cases, a detailed project report shall be submitted after verification by the in-house mentor and industry/funding agency mentor/authority. In case of standalone/non- sponsored activity, i.e. without any funding agency/industry collaboration, the detailed project report shall be submitted after verification by the in-house mentor.
6. If pursuing a Topic offered by the department or in-house mentor, the outcome of the in-house internship should include the publication of a journal paper, preferably in an SCI/Scopus/UGC care listed/indexed conference. The detailed project report must be submitted and verified by the in-house mentor.
7. All the designated work shall be submitted to the department in the form of a report in hard- bound as well as soft copy.
8. Evaluation Scheme:

Continuous Assessment (A):

- A logbook (as per Table 3) of the work done must be maintained by each group.
- Each in-house internship activity will be reviewed twice in the semester. In the first review (as per Table 4), at least 40% work shall be completed including the topic identification / introduction/ scope of the work, literature survey, problem definition and objectives. The remaining 60% of work shall be completed in the second review (as per Table 5) including implementations, key findings, publications & /patenting & /copyright & / product development etc.

End Semester Examination:

End semester examination (as per Table 6) will be jointly evaluated by the faculty mentor and an external examiner appointed by the HOD in consultation with the COE.

Assessment Formats:**Table 3:** Log Book Format

Sr. No	Week (Start Date: End Date)	Work Done	Sign of In- house mentor	Sign of Coordinator

Table 4: First Review

Sr. No	Topic Identification & Validation	Literature Survey	Problem Definition	Objectives
	20 Marks	20 Marks	20 Marks	15 Marks

Table 5: Second Review

Sr. No	Implementation	Publications	Report	Presentation
	20 Marks	20 Marks	20 Marks	15 Marks

Table 6: End Semester Examination

Sr. No	Topic Identification & Validation	Literature Survey & Problem Definition	Objectives & Implementation/ Product Development	Presentation	Report, Publications/Patent /IPR documents
	30 Marks	30 Marks	30 Marks	30 Marks	30 Marks

Program: Electronics and Telecommunication Engineering	Final Year B. Tech
	Sem-VIII
Disaster Management and Preparedness (22MCET8040T)	

Pre-requisite:

- Basic knowledge of environmental studies.

Course Objectives:

- To provide a basic understanding of hazards, disasters, and their various types and categories.
- To identify the extent and damaging capacity of disasters.
- To study loss mechanisms and effective methods for their mitigation.
- To understand the roles and responsibilities of individuals and organizations during and after disasters.
- To appreciate the significance of GIS and GPS in disaster management.
- To understand emergency government response structures before, during, and after disasters.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply disaster management principles and guidelines	L3	Apply
CO2	Analyze risk assessments.	L4	Analyze
CO3	Determine community awareness and participation	L3	Apply
CO4	Use science and technology tools (GIS, GPS)	L3	Apply
CO5	Prepare disaster management plans.	L3	Apply

Disaster Management and Preparedness (22MCET8040T)

COURSE CONTENTS

Unit-I Understanding Disasters & Hazards 6 Hrs.

Definition and types of disasters: Natural, Man-made and hybrid disasters, Study of Natural disasters: Flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion etc. Study of Human/Technology Induced Disasters: Chemical, Industrial and Nu-clear disasters, internally displaced persons, road and train accidents Fire Hazards, terrorism, militancy.

Hazard & Vulnerability profiles of India (seismic zones, flood-prone areas).

India's vulnerability to disasters, and the impact of disasters on National development.

Unit-II Disaster Risk Reduction (DRR)& Mitigation 6 Hrs.

Disaster Management Cycle: Prevention, Mitigation, Preparedness, Response, Recovery. Need for disaster prevention and mitigation, mitigation guiding principles, challenging areas, structural and non-structural measures for disaster risk reduction.

Risk Assessment & Vulnerability Analysis.

Science & Technology: Use of information management, Geo informatics like RS, GIS, GPS and remote sensing mitigation measure.

Unit-III Disaster Preparedness & Response 4 Hrs.

Preparedness Planning, Early Warning Systems (EWS) & Communication.

Emergency Response: Search & Rescue, Logistics, Medical Aid.

Psychological Response & Management (Trauma, Stress).

Role of IT, Media, Govt., NGOs, & Community.

Unit-IV Recovery, Rehabilitation & Reconstruction 4 Hrs.

Post-disaster damage assessment.

Rehabilitation, Reconstruction & Livelihood Restoration.

Sanitation, Hygiene, & Waste Management.

Unit-V Policy, Governance & Capacity Building 4 Hrs.

National Disaster Management Authority (NDMA) & Legislation.

Institutional Mechanisms & Community Mobilization. Non-Structural Mitigation

Community based disaster preparedness, capacity development and training, awareness and education, contingency plans.

Unit-VI Case studies on disaster (National /International) 4 Hrs.

Case study discussion of National Disasters: Tsunami (2004), Bhopal gas tragedy, Kerala and

Uttarakhand flood disaster, 26th July 2005 Mumbai flood

Case study discussion of International Disasters: Hiroshima – Nagasaki (Japan), Cyclone Phailin (2013), Fukushima, Daiichi nuclear disaster (2011), Chernobyl meltdown.

Reference Books

1. Disaster Management, by Harsh K. Gupta, Universities Press Publications (2003).
2. Disaster Management: An Appraisal of Institutional Mechanisms in India, by O. S. Dagur, published by Centre for Land Warfare Studies, New Delhi, 2011.
3. Introduction to International Disaster Management, by Damon Copolla, Butterworth Heinemann Elsevier Publications (2015).
4. Disaster Management Handbook, by Jack Pinkowski, CRC Press, Taylor and Francis group (2008).
5. Disaster management & rehabilitation, by Rajdeep Dasgupta, Mittal Publications, New Delhi (2007).
6. Natural Hazards and Disaster Management, Vulnerability and Mitigation, by R B Singh, Rawat Publications (2006).
7. Concepts and Techniques of GIS, by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications (2006).
8. Risk management of natural disasters, by Claudia G. Flores Gonzales, KIT Scientific Publishing (2010).
9. Disaster Management – a disaster manager’s handbook, by W. Nick Carter, Asian Development Bank (2008).
10. Disaster Management in India, by R. K. Srivastava, Ministry of Home Affairs, GoI, New Delhi (2011)
11. The Chernobyl Disaster: Legacy and Impact on the Future of Nuclear Energy, by Wil Mara, Marshall Cavendish Corporation, New York, 2011.
12. The Fukushima 2011 Disaster, by Ronald Eisler, Taylor & Francis, Florida, 2013.

Learners are expected to refer to reports published at the national and international levels and updated information available on authentic websites.