BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)Avalahalli, Yelahanka, Bengaluru-560064

Bachelor of Engineering

Department of Electronics and Telecommunication Engineering

VII Semester Scheme and Syllabus

2021 Scheme - Autonomous

Vision of the Department

To emerge as a premier department developing high quality Electronics and Telecommunication Engineering Professionals with ethics and eco-friendliness for bettermentof the society.

Mission of the Department

Impart quality education in Electronics and Telecommunication Engineering by facilitating:

M1: Conducive learning environment and research activities

M2: Good communication skills, leadership qualities and

ethics**M3:** Strong Industry-Institute interaction

Program Educational Objectives (PEOs)

After three to four years of graduation our graduates will:

PEO 1: Excel as Professionals in Electronics, Telecommunication and IT related fields.

PEO 2: Engage in life-long learning.

PEO 3: Maintain ethical norms, exhibit good communication skills and leadership qualities.

Program Specific Outcomes (PSOs)

PSO 1: Analyze and design communication systems

PSO 2: Analyze and implement signal processing applications

PSO 3: Design and implement embedded systems

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BMS Institute of Technology and Management
(An Autonomous Institution, Affiliated to VTU Belagavi)
Avalahalli, Doddaballapur Main Road, Bengaluru, Karnataka – 560064

Ref.: BMSIT&M/Exam/2023-24/ 103 **Date:** 21.09.2024

CONTINUOUS INTERNAL EVALUATION
AND
SEMESTER END EXAMINATION PATTERN
(Applicable to UG students of 2021 Batch, effective from the Academic year 2024-25 onwards)

The UG students admitted during 2021-22 are hereby informed to note the following with reference to Continuous Internal Evaluation and Semester End Examination pattern:

The weightage for Continuous Internal Evaluation (CIE) is 50%, and for Semester End Examinations (SEE), it is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 out of 50), while for the SEE, the minimum passing mark is 35% of the maximum marks (18 out of 50). A student will be declared to have passed the course if they secure at least 40% (40 out of 100) in the combined total of the CIE and SEE.

The details below summarize the CIE and SEE Pattern for the courses of 2021 scheme of various credits:

4 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- **Internal Assessment (IA) Tests:** 2 IAs to be conducted for **40 Marks** (90 minutes each). Total of 2 tests will be 80 and the same can be scale down to **30 Marks.**
- **Alternate Assessment Tool (AAT):** 2 AATs each of **10 Marks**, total **20 Marks.** Any Two AATs can be used from the list. If it is project based, one AAT shall be given.
- **Total CIE Marks** = 30 + 20 = **50 Marks**
- Student has to score a minimum of **20 Marks** (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

- SEE is conducted for 100 Marks (3 hours).
- **Question Paper Pattern:**
  - **Part - A:** Comprises 20 objective type questions carrying 1 Mark each with a total 20 Marks.
  - **Part - B:** There will be **5 modules**. Each module will have **TWO questions carrying 16 marks** each. There will be a maximum of three sub section for each question. **Student has to answer any ONE full question.**

- **SEE Marks = 20 + 80 = 100 marks and can be scale down to 50 marks.**

3 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- **Internal Assessment (IA) Tests:** 2 IAs to be conducted for **40 Marks** (90 minutes each). Total of 2 tests will be 80 and the same can be scale down to **30 Marks.**
- **Alternate Assessment Tool (AAT):** 2 AATs each of **10 Marks**, total **20 Marks.** Any Two AATs can be used from the list. If it is project based, one AAT shall be given.
- **Total CIE Marks** = 30 + 20 = **50 Marks**
- Student has to score a minimum of **20 Marks** (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

- SEE is conducted for 100 Marks (3 hours).
- **Question Paper Pattern:**
  - **Part - A:** Comprises 20 objective type questions carrying 1 Mark each with a total 20 Marks.
  - **Part - B:** There will be **5 modules**. Each module will have **TWO questions carrying 16 marks** each. There will be a maximum of three sub section for each question. **Student has to answer any ONE full question.**

- **SEE Marks = 20 + 80 = 100 marks and can be scale down to 50 marks.**

2 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 2 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 2 tests will be 80 and the same can be scale down to **30 marks.**
- **Alternate Assessment Tool (AAT):** 2 AATs each of 10 marks, total **20 marks.** Any Two AATs can be used from the list. If it is project based, one AAT shall be given.
- **Total CIE Marks** = 30 + 20 = **50 Marks**
- Student has to score a minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks (2 hours).

Question Paper Pattern:

- The pattern of the question paper is MCQ.
- SEE question paper will be set for 100 questions each of 01 marks. The same is scale down to 50 marks. Minimum SEE Marks: 40% (i.e. 20 Marks out of 50)

1 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- **Internal Assessment (IA) Tests:** 2 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 2 tests will be 80 and the same can be scale down to **30 marks.**
- **Alternate Assessment Tool (AAT):** 2 AATs each of 10 marks, total **20 marks.** Any Two AATs can be used from the list. If it is project based, one AAT shall be given.
- **Total CIE marks** = 30 + 20 = **50 Marks**
- Student has to score a minimum of **20 Marks** (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

- SEE is conducted for **50 Marks** (1 hours).
- **Question Paper Pattern:**
  - The pattern of the question paper is MCQ.
  - SEE question paper will be set for 50 questions each of 01marks. The same is scale down to **50 Marks**.

1 CREDIT LABORATORY COURSE / PROFESSIONAL CORE LABORATORY / ABILITY ENHANCEMENT COURSE

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- **Cumulative Assessment (CA)** of each experiment is 20 Marks (Conduction 10 marks + Records 5 marks +Viva 5marks). The average of all the experiments to be taken for **20 Marks.**
- **Open Ended Experiments (OE) 10 Marks.**
- **2 IAs Test** to be conducted for 100 marks. General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.: 60 marks and Viva: 20 marks. The average of 2 IA marks is scale down to **20 Marks**.
- **CIE marks** =20 (CA) +10 (OE) + 20 (IA test) = **50 Marks**.
- Student has to score a minimum of **20 Marks** (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

- SEE is conducted for 100 Marks.
- Examinations to be conducted jointly by Two examiners.
- All the experiments are to be included for practical examination.
- General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.,: 60 marks and Viva: 20 marks.

Learning Activities for AATs:

A faculty member may choose the following AATs based on the needs of the course:

1. Course project
2. Literature review
3. MOOC
4. Case studies
5. Tool exploration
6. GATE-based aptitude test
7. Open book tests
8. Industry integrated learning
9. Analysis of Industry / Technical / Business reports
10. Programming assignments with higher Bloom level
11. Group discussions
12. Industrial / Social / Rural projects

CoE 21/09/2024

Dean AA 21.09.24

Principal 21/9/2024

Copy To:

1. The Vice-Principal, Deans, HoDs, and Associate HoDs
2. All faculty members and students of 2021 batch.
3. Examination Section

VII Semester

Scheme and Syllabus

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU)

Scheme of Teaching and Examination: Effective from AY 2021–22

Choice Based Credit System (CBCS)

UG Program: Department of Electronics & Telecommunication Engineering (ETE) | **Semester: VII**

Sl. No.	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS71	Research Methodology	ET	2	0	0	0	2	2	50	50	100
2	AEC	21ET72	Computer Communication Networks Lab	ET	0	0	2	0	1	3	50	50	100
3	PE	21ET73X	Professional Elective III	ET	3	0	0	0	3	3	50	50	100
4	PE	21ET74X	Professional Elective IV	ET	3	0	0	0	3	3	50	50	100
5	OE	21ET75X	Open Elective II	ET	3	0	0	0	3	3	50	50	100
6	PW	21ETP76	Project Work Phase I	ET	0	0	0	10	5	-	100	-	100
TOTAL					**11**	**0**	**2**	**10**	**17**		**350**	**250**	**600**

Professional Elective- III		Professional Elective- IV		Open Elective II	
Course Code	**Course Title**	**Course Code**	**Course Title**	**Course Code**	**Course Title**
21ET731	Internet of Things	21ET741	Machine Learning and Deep Learning	21ET751	Medical Devices and Applications
21ET732	Satellite Communication	21ET742	Software-defined radio	21ET752	Start-up Management
21ET733	Modern Radar Systems	21ET743	5G Technology	21ET753	Optical Fiber Networks
21ET734	Nano Electronics	21ET744	Wireless Sensor Networks	21ET754	Wireless Personal Area Network
21ET735	Digital Image Processing	21ET745	Cryptography & Network Security	21ET755	Multi Media Communications

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Research Methodology (2:0:0) 2

Common to all Branches

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21HSS71	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:0	SEE Marks	50
Total Number of Lecture Hours	26	Exam Hours	02

Course objectives:

This course will enable students to

1. Give an overview of the research methodology, research problem.
2. Gain knowledge on research design.
3. Design of sampling survey and measurement & scaling.
4. Understand data collection and data preparation.
5. Familiarize interpretation and writing research reports.

Preamble:

Importance of Research and Development (R&D) for development of Nation, Introduction to research and research methodology.

Module – 1

Introduction:

Meaning of Research, objectives of Research, Types of research, Research Approaches, Significance of Research, Research Process, Criteria of Good Research.

Defining the Research Problem:

What is a Research Problem? Selecting the Research Problem, Necessity of Defining the Problem, Techniques Involved in Defining a problem.

(6 Hours)

Module – 2

Research Design:

Meaning of Research Design, need for Research design, Feature of a Good design, Important concepts relating to Research Design: Dependent, independent and extraneous variable, Control, Confounded relationship. Research Design in case of exploratory research studies, in case of descriptive and diagnostic research studies Basic Principles of Experimental Designs.

(5 Hours)

Module – 3

Design of sampling survey:

Sample Design: Objective, sampling units and frame, size of sample, parameter of interest, selection of proper sample design, pilot survey and budgetary constraints. Sampling errors, non-sampling errors, Sample survey vs. census survey, on-probability samplings.

Measurement and scaling:

Quantitative and qualitative data,Classification of measurement scales. Goodness of measurement scales: Techniques of developing measurement tools, scaling, Scale classification bases, scaling techniques.

(5 Hours)

Module – 4

Data Collection:
Experiments and Surveys, collection of primary data: observation method, Interview method. Collection of data through questionnaires, Collection of data through schedules. Collection of secondary data. Selection of appropriate method for data collection, case study method.

Data Preparation:
Questionnaire checking, editing, coding, tabulation, data cleaning, data adjusting, problems in preparation process, missing values and outliers, type of analysis.

(5 Hours)

Module – 5

Interpretation and Report Writing:
Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of Research Report, Types of Reports: Technical report, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research.

(5 Hours)

Course outcomes:
The students will be able to:
CO1: Acquire some basic concepts of research and its methodologies
CO2: Describe the different types of research design methods
CO3: Explain the various sampling, measurement, and scaling techniques
CO4: Analyse the ethical practices in conducting research and disseminations of results in different forms using data collection and data preparation methods
CO5: Apply various techniques to interpret research reports.

Text Book:

1. CR Kothari and Gaurav Garg, Research Methodology, New Age International Publishers, 2020.

References:
1. Panneerselvam R, Research Methodology, Prentice Hall of India, New Delhi, 2004.
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U K, An introduction to Research Methodology, RBSA Publishers, 2002.
3. Ranjit Kumar, Research Methodology, 4th Edition, SAGE Publications Ltd. 2014.

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Computer Communication Networks Lab (0:0:1) 1

(Effective from the academic year 2024-25- 2021 Scheme)

Course Code	21ET72	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	20	Exam Hours	03

Course Objectives:

This course will enable students to:

1. Acquire the fundamental concepts of computer network technology.
2. Understand the protocols and technologies used for computer communication networks.
3. Simulate the network models with various protocols to analyze the network performance

Preamble:

OSI models, Network Topologies and Significance and scope of Computer Communication Networks.

1. Simulate a Point to Point Network with Four Nodes and Duplex Links between them. Analyze the Network Performance by Setting the Queue Size and Varying the Bandwidth using NS 2
2. Build a Four-node Point to Point Network with links n0-n2, n1-n2 and n2-n3. Connect a TCP link between n0-n3 and UDP link between n1-n3 Using NS2.

(i) Define BERs for Links. Compare TCP and UDP Protocols when errors occur.

(ii) Modify to Simulate a Link Failure between the Host and the Target Node. Compare TCP and UDP . Protocols when the Target Node is not accessible.

3. To analyze the performance of various configurations and protocols in LAN using CISCO packet tracer.
4. To Analyze the operation of Routing Information Protocol (RIP) using CISCO Packet tracer.
5. Write a Program for a HDLC Frame to perform the Bit Stuffing and Character Stuffing.
6. Write a Program for Dijkstra's Algorithm to Compute the Shortest Routing Path.
7. Write a program for a simple RSA algorithm to encrypt and decrypt the data.
8. Write a program for Hamming code generation for error detection and correction.

Open ended Experiment :

9. Write a program for congestion control using a leaky bucket algorithm.
10. Write Programs for Simulation of Stop and Wait Protocol and Sliding Window Protocol.

Course outcomes:

The students will be able to:

CO1: Conduct an experiment related to algorithms/protocols of computer network technology

CO2: write a report on the conducted experiments.

CO3: Conduct an open ended experiment for given specifications related to computer

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Internet of Things (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET731	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course objectives: This course will enable students to

1. Assess the genesis and impact of IoT applications, architectures in real world.
2. Illustrate diverse methods of deploying smart objects and connect them to network.
3. Compare different Application protocols for IoT.
4. Infer the role of Data Analytics and Security in IoT.
5. Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

Preamble:

Introduction to Internet of Things, its significance and scope in the current scenario. Industrial applications, research and innovations related to IoT. Impact of the course on society problems, sustainable solutions and national economy.

Module – 1

Overview of Internet of Things:

IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT,M2M communication, Examples of IoT. Modified OSI Model for the IoT/M2M Systems, data enrichment, data consolidation and device management at IoT/M2M Gateway, web communication protocols used by connected IoT/M2M devices, Message communication protocols (CoAP-SMS, CoAP-MQ, MQTT,XMPP) for IoT/M2M devices.

(8Hours)

Module – 2

Architecture and Design Principles for IoT:

Internet connectivity, Internet-based communication, IPv4, IPv6, 6LoWPAN protocol, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS,FTP,TELNET and ports.

Data Collection, Storage and Computing using a Cloud Platform:

Introduction, Cloud computing paradigm for data collection, storage and computing, Cloud service nmodels, IoT Cloud- based data collection, storage and computing services using Nimbits.

(8 Hours)

Module – 3

Prototyping and Designing Software for IoT Applications:

Introduction, Prototyping Embedded device software, Programming Embedded Device Arduino Platform using IDE, Reading data from sensors and devices, Devices, Gateways, Internet and Web/Cloud services software development. Programming MQTT clients and MQTT server. Introduction to IoT privacy and security. Vulnerabilities, security requirements and threat analysis, IoT Security Tomography and layered attacker model.

(8 Hours)

Module – 4

IoT Privacy, Security and Vulnerabilities Solutions:

Introduction, Vulnerabilities, Security requirement and threat analysis, Use cases, IoT security Tomography, Layered attacker model, Identity Management and establishment, Access control, Secure message communication.

(8 Hours)

Module – 5

IoT Case Studies:

Introduction, Design Layers, Design Complexity and Designing Using cloud Paas, IoT/IIot Applications in the Premises, Supply-Chain and customer monitoring, Connected car and its applications, IoT Applications for Smart Homes, Cities, Environment monitoring and agriculture, Smart city street lights controlling and monitoring.

Summary of the Course:

Students will be acquire the knowledge in IoT technology and Sensor networks.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Understand the characteristics, basics of IoT
CO2: Apply the knowledge of device management to establish an IoT system
CO3: Apply the knowledge of uplink and downlink protocols to establish an IoT System
CO4: Analyze the data, mobile network protocols and case studies to develop an IoT application

Textbooks:

1. Raj Kamal, “Internet of Things: Architecture and Design Principles”, McGraw Hill Education, 2017.
2. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks"

References:

1. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing
2. Approach", Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, & TaiebZnati, “Wireless Sensor Networks- Technology,
4. Protocols, and Applications”, John Wiley, 2007.
5. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003

Alternate Assessment Tools (AATs) suggested:

- Students have to provide oral presentation on IOTs

Web links / e – resources:

- https://www.coursera.org/learn/iot
- https://www.coursera.org/learn/iot
- https://www.edx.org/learn/iot-internet-of-things

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Satellite Communication (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET732	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand the principles of Satellite Orbits.
2. Study various techniques used in Satellite Communication.
3. Learn Designing of satellite Up/down links.
4. Utilization of Principles of Satellite communication in remote sensing.

Preamble:

Satellite communication, Significance of satellite communication and remote sensing, Research in the field of satellite communication, Impact of satellite communication and remote sensing on societal problems and sustainable solutions

Module – 1

Satellite orbits:

Orbital mechanics, Kepler`s laws of planetary motion, describing the orbit, orbital elements, geostationary orbit radius, look angle determination, orbital perturbations, orbit determination.

Satellites:

Satellite subsystems, attitude and orbit control system, telemetry, tracking command and monitoring, power systems, communication sub systems, satellite antennas, equipment reliability and space qualification.

(9 Hours)

Module – 2

Satellite link design:

Basic transmission theory, system noise temperature and G/T ratio, down link design, link budget, and uplink design with examples, system design examples.

(**7 Hours)**

Module – 3

Multiple access:

Frequency division multiple access (FDMA), Time division multiple access (TDMA), on board processing, Demand access multiple access (DAMA), code division multiple access (CDMA). GPS position locating principles

(7 Hours)

Module – 4

Remote sensing:

Historical background, international space law, Fundamentals of remote sensing. Electromagnetic spectrum: Terms and units of measurements, EM radiation laws, spectral signature, vegetation and soil reflectance. Thermal infra-red domain: Characteristics of EM radiation in thermal infra-red region, thermal properties of vegetation. Microwave region: Atmospheric interaction.

(8 Hours)

Module – 5

Sensors and remote sensing satellites:

Passive and active sensors, characteristics of photographic images, radar and LIDAR. Organization of remote sensing project. Interpretation phase.

Summary of the course:

The student will be able to explore the concepts, challenges and requirements of satellite communication and application of the same for remote sensing of weather, temperature vegetation, surveillance etc.

(9 Hours)

Course outcomes:

The students will be able to:

CO1:Understand the fundamentals of satellite communication and remote sensing

CO2: Use different multiple access techniques required to for space communication

CO3: **Apply** the knowledge of different laws, electromagnetics, link design techniques for Communication through satellite and remote sensing

CO4: **Analyze** the link design, Multiple access methods, sensors required for satellite communication and remote sensing

Textbooks:

1. Timothy Pratt**,** "Satellite Communications", 2nd Edition,Wiley-INDIA Pvt. Ltd.2017
2. Emilo Chuvieco, "Fundamentals of satellite remote sensing", CRC press, 2009.

Reference Books:

1. Dennis Roddy, "Satellite Communications", 4th Edition, McGraw-Hill, 2017.

Alternate Assessment Tools (AATs) suggested:

- Students have to provide oral presentation of Satellite Communication

Web links / e – resources:

- https://ernet.in/content/vsat-communication-services
- https://www.cgi.com/en/space/satellite-communications
- http://www.rsi.ca
- http://www.npagroup.com/

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Modern Radar Systems (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET733	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course objectives:

This course will enable the Students to:

1. Learn the constructional and operational details of Radar systems.
2. Study the different types of Radar systems and characteristics of the same.
3. Know the signal processing, scanning methods and types of antennas used in radar system.
4. Understand the working principle of surveillance Radars.

Module – 1

Preamble:

RADAR communication, Significance of RADAR system in the current scenario, Industrial /defence application, research in the field of RADARs, Impact of the Radio detection on society and sustainable solutions.

Basics of Radar:

Principle of radar, Maximum Unambiguous Range, Definitions w.r.t pulse waveform, Radar Block Diagram Radar Frequencies, Applications of Radar.

Simple form of the Radar Equation:

Receiver Noise, SNR, Modified radar range Equation.

(9 Hours)

Module – 2

MTI and Pulse Doppler Radar:

Doppler Frequency Shift, Simple CW Radar, sweep to Sweep subtraction and Delay Line Canceler, MTI Radar, Delay Line Cancelers Blind Speeds, Clutter Attenuation, MTI Improvement Factor, N- Pulse Delay-Line Canceler.

Digital MTI Processing:

Blind phases, I and Q Channels, Digital MTI, Doppler signal processor, Moving Target Detector-Original MTD

(8 Hours)

Module – 3

Tracking Radar:

Tracking with Radar- Types of Tracking Radar Systems, Monopulse Tracking- Amplitude Comparison, Monopulse, Phase Comparison Monopulse.

Sequential Lobing:

Conical Scan Tracking, Block Diagram of Conical Scan Tracking Radar, Tracking in Range, Comparison of Trackers.

(7 Hours)

Module – 4

The Radar Antenna:

Functions of the Radar Antenna, Antenna parameters, Reflector antennas and Electronically Steered Phased array Antennas.

Radar Receiver:

The Radar Receiver, Receiver Noise Figure, Super Heterodyne Receiver, Duplexers and Receivers Protectors, Radar displays.

(7 Hours)

Module – 5

Synthetic Aperture and Air Surveillance Radar:

Synthetic aperture radar – resolution, radar equation, SAR signal processing, inverse SAR. Air surveillance radar – user's requirements, characteristics and considerations. ECCM and Bi-static Radar: Electronic counter – counter measures. Bistatic radar – description, bi-static radar equation, comparison of mono-static and bi-static radars.

Summary of the Course:

The students will be able to explorebasic requirements of a RADAR system and different types of RADARs.

(9Hours)

Course outcomes:

The students will be able to:

CO1: Understand the principle of Radar communication system and also different types of Radar.
CO2: Apply different mathematical approaches to solve the problems related to types of Radar.
CO3: Use different communication techniques in the design of various types of RADARs
CO4: Analyze the characteristics related to Radar signal processing and communication aspects

Textbooks:

1. M.I.Skolnik, "Introduction to Radar Systems"**,** 2nd Edition, McGraw Hill, 2002.
2. M.S.Nagaraja, "Elements of Electronic Navigation",2nd Edition, McGraw Hill, 1996.

References:

1. David M Pozar, "Radar, Sonar And Navigation Engineering" , 2nd Edition, S K Kataria & Sons.

Alternate Assessment Tools (AATs) suggested:

- Literature Survey Activity

Web links / e – resources:

- https://www.ll.mit.edu/outreach/radar-introduction-radar-systems-online-course
- https://www.classcentral.com/course/swayam-principles-and-techniques-of-modern-radar-systems-14247
- https://onlinecourses.nptel.ac.in/noc23_ee133/preview

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS) applicable for 2021 Scheme

SEMESTER – VII

Nano Electronics (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET734	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course objectives:

This course will enable students to

1. Understand and appreciate the role of nanotechnology in our day today life
2. Learn different device characteristics and fabrication techniques
3. Explain concepts behind the device physics of all Nano structures
4. Familiarize with present research front in Nano electronics and its applications to industry and society

Preamble:

Importance of nanotechnology, its role in our day today life, Technology Challenges, opportunities and its impact on the economic growth of country.

Module – 1

Background to nanotechnology:

Types of nanotechnology and Nano machines, Periodic table, Atomic structure, Molecules and phases, energy, Molecular and atomic size, Surface and dimensional space, Top down and bottom up.

Nano materials:

Preparation Plasma arcing, Chemical vapour deposition, Sol-gels, Electro deposition – ball milling –applications of Nano material.

(8Hours)

Module – 2

Fundamentals of Nano electronics:

Fundamentals of logic devices, Requirements, Dynamic properties, Threshold gates, physical limits to computations, Concepts of logic devices, Classifications, Two terminal devices, Field effect devices, Coulomb blockade devices, Spintronics, Quantum cellular automata, Quantum computing.

(8Hours)

Module – 3

Quantum Transport Devices Based on Resonant Tunnelling:

Electron tunneling – resonant tunnelling diodes – resonant tunnelling devices; Single electron devices for logic applications: - Single electron devices – applications of single electron devices to logic circuits**.**

(8Hours)

Module – 4

Carbon Nanotubes:

Carbon Nanotube: Fullerenes types of nanotubes formation of nanotubes assemblies' purification of carbon nanotubes electronic properties synthesis of carbon nanotubes carbon nanotube interconnects carbon nanotube FETs Nanotube for memory applications prospects of an all carbon nanotubes Nano electronics**.**

(8Hours)

Module – 5

Molecular Electronics:

Electrodes & contacts, Functions, Molecular electronic devices, First test systems, simulation and circuit design, Fabrication, Future applications, MEMS, NEMS, Robots, Random access memory, Mass storage devices.

Summary of the Course:

This course gives insight into nanotechnology and its role in electronics systems and its impact on the performance of systems starting from logic devices to quantum computing. The different structures of Carbon Nanotubes and their applications are covered in the course. Finally, an attempt is made to explore molecular electronics and its fabrications aspects including micro/Nano robot applications.

(8Hours)

Course Outcomes:

The students will be able to:

CO1: Understand the nanotechnology and its wider applications prospective

CO2: **Apply** the fundamental knowledge of device characteristics to model them

CO3: **Analyse** different nano device structures for practical applications

CO4: **Evaluate** the performance of Nano devices for different applications

Textbooks:

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons," Nanotechnology: Basic Science and Emerging Technologies", Chapman & Hall / CRC, 2002.
2. T. Pradeep, NANO: The Essentials, Understanding Nano science and Nanotechnology. TMH, 2007.

References:

1. Rainer Waser (Ed.), Nano electronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003
2. Mitin. V. Kochelap V, Stroscio. M —Introduction to Nano electronics||, Cambridge University Press, 2008
3. Karl Goser, Peter Glosekotter, Jan Dienstuhl, —Nano electronics and Nanosystems||, Springer, 2004

Alternate Assessment Tools (AATs) suggested:

Students will be asked to explore TOOLs like MugFET/Nanowire/Comsol/available at nanohub.org (Purdue University) to evaluate the performance of nano devices (AAT)

Web links / e – resources:

www.Nanohub.org

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Digital Image Processing (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET735	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to: (List as per the requirement of your course)

1.To understand the fundamentals of digital image processing.

2. To familiar with Image transforms, image enhancement techniques in spatial domain

3. To analyze image in frequency domain

4. To analyze techniques to restore images.

5. To understand the Morphological Operations and color models used in digital image processing.

Preamble:

The purpose of this course is to provide the basic concepts and methodologies for Digital Image Processing in three different levels. At the lowest level, the course introduces the terminology of image processing, how digital images are acquired, how the data is stored, image formats; relationship between pixels and spatial & frequency domain concepts for enhancement. The course addresses how the algorithm utilizes low level results for the next level processes such as extracting useful information and morphological processing. It even addresses how the algorithm attempts to extract the semantic information from those provided by the lower levels for real world image processing applications.

Module – 1

Introduction to digital image processing:

What is Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, applications?

Image sampling and Quantization:

Elements of Visual Perception, Image Sensing and Acquisition, Types of digital images, Basic Relationships Between Pixels

(8 Hours)

Module – 2

Image Enhancement in spatial domain:
Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

(8 Hours)

Module – 3

Image Enhancement in Frequency Domain:
Preliminary concepts, The Discrete Fourier Transform, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters.

(8 Hours)

Module – 4

Restoration:
Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position-Invariant degradations Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error(Wiener) Filtering, Constrained Least Squares Filtering.

(8 Hours)

Module – 5

Morphological Image Processing:
Preliminaries, Erosion and Dilation, Opening and Closing
Segmentation:
Point, Line and Edge detection, Thresholding, Region based segmentation.
Color Image Processing:
Color Fundamentals, Color Models, Pseudo color Image Processing.

(**8 Hours)**

Course Outcomes:

The students will be able to:

CO1: Understand the basic operations, analysis techniques of images.
CO2: Apply different image transforms,
CO3: Apply image processing techniques for image enhancement.
CO4: Apply image processing techniques for image restoration.
CO5: Understand the basics of morphological image processing and colour models

Textbooks:

1. Digital Image Processing - Rafel C Gonzalez and Richard E. Woods, PHI, 3rd Edition 2010
2. Digital Image Processing Using MATLAB - Rafel C Gonzalez, Richard E. Woods and Steven E Eddins, TMH, 2nd Edition, 2010.

References:

1. Digital Image Processing- S. Jayaraman, S. Esakkirajan, T. Veerakumar, Tata Mc GrawHill2014
2. Digital Image Processing with MATLAB- Vipula Singh

Alternate Assessment Tools (AATs) suggested:

Image processing using modern tool, apply these concepts to solve societal problems and Submit the report as part of course. Some sample problems are given.

- Image file formats, Data types and conversions, Basic commands used for Point processing.
- Dilation and erosion, Edge detection, Color images in MATLAB, Pseudocoloring, Processing of color images programming.
- Low and High pass filters, Gaussian filters, cleaning salt and pepper noise, Cleaning Gaussian noise programming.

MooC Courses on image processing applications.

Web links / e – resources:

- www.imageprocessingplace.com.
- https://www.coursera.org/specializations/image-processing
- https://www.mathworks.com/products/image-processing.html

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Machine Learning and Deep Learning (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET741	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand basic fundamentals of neural networks
2. Analyze advanced topics such as recurrent neural networks, long short term memory cells
3. Appreciate deep learning with convolutional neural networks.
4. Implement programming assignments related to these topics

Preamble:

Machine Learning Usually plays an important role in the transition from data storage to decision systems based on large databases signals such as the obtained from sensor networks, internet services, or communication systems. These systems imply developing both computational solutions and novel models. Signal processing: a field at the heart of science and everyday life. Deep learning is a sub field of Machine learning, it is a key enabler of AI powered technologies being developed across the globe. In this course, students will learn an intuitive approach to build complex models that help machines and solve real-world problems with human-like intelligence.

Module – 1

Introduction to machine learning:

Need for Machine Learning, Machine Learning Explained, and Machine Learning in relation to other fields, Types of Machine Learning. Challenges of Machine Learning, Machine Learning process, Machine Learning applications.

Understanding Data:

What is data, types of data, Big data analytics and types of analytics, Big data analytics framework, Descriptive statistics, univariate data analysis and visualization.

(8Hours)

Module – 2

Understanding Data Bivariate and Multivariate data, Multivariate statistics, Essential mathematics for Multivariate data, Overview hypothesis, Feature engineering and dimensionality reduction techniques, Basics of Learning Theory: Introduction to learning and its types, Introduction computation learning theory, Design of learning system, Introduction concept learning. Similarity-based learning: Introduction to Similarity or instance based learning, Nearest-neighbour learning, weighted k- Nearest - Neighbour algorithm.

(8 Hours)

Module – 3

Artificial Neural Network:

Introduction, Biological neurons, Artificial neurons, Perceptron and learning theory, types of Artificial neural Network, learning in multilayer Perceptron, Radial basis function neural network, self-organizing feature map)

(8 Hours)

Module – 4

Deep Neural networks:

Introduction deep learning, Improvement of the Deep Neural Network, Vanishing Gradient, overfitting , Computational Load ,Example: ReLU and Dropout, ReLU Function, Dropout.

(8Hours)

Module – 5

Convolution Neural Network :

Introduction, Architecture of ConvNet, Convolution Layer, Pooling Layer, Example: MNIST

Course outcomes:

The students will be able to:

CO1**: Understand the basic algorithms of** Machine learning.

CO2**: Apply** the concepts of mathematics for neural networks algorithms.

CO3**: Apply** the fundamentals concepts of mathematics for DNN algorithms.

CO4**: Analyze the** deep neural network on real world data.

Textbooks:

1. S. Sridhar, M Vijayalakshmi "Machine Learning". Oxford ,2021
2. Phil Kim Seoul, "MATLAB Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence", Korea (Republic of) ISBN-13 : 978-1-4842-2844-9 ISBN-13 (electronic): 978-1-4842-2845-6 . DOI 10.1007/978-1-4842-2845-6.

References:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.
2. Ian Goodfellow and Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press**,** 2016.
3. M. P. Deisenroth, A. A. Faisal, C. S. Ong, Mathematics for Machine Learning, Cambridge University Press (1st edition) ,T. Mitchell, Machine Learning, McGraw Hill, 1997 Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

Alternate Assessment Tools (AATs) suggested:

- AI based applications using modern tool, apply these concepts to solve societal problems and Submit the report as part of course.
- MooC Courses on implementation using CNN algorithms.

Web links / e – resources:

- https://www.coursera.org/specializations/deep-learning
- https://www.geeksforgeeks.org/machine-learning/
- https://www.geeksforgeeks.org/machine-learning/

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VII

Software Defined Radio (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET742	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable the Students to:

1. Learn the requirements for SDR and the benefits of multi-standard terminals.
2. Understand the basic architecture of SDR.
3. Acquire the knowledge of Flexible RF transmitter, receiver architecture.

Preamble:

Importance of software defined radio, Significance and Scope of the SDR in economic growth of Nation, Impact of the SDR on Societal Problems, Career Perspective, Innovations, Research status/trends.

Module – 1

Introduction:

The requirement for software defined radio, the benefits of multi-standard terminals, operational requirements, business models for software defined radio, new base station and network architectures**.**

(8 Hours)

Module – 2

Basic Architecture of a Software Defined Radio:

Software defined radio architectures; Ideal Software defined radio architectures, Required hardware specifications, Digital aspects of a Software Defined radio, Current technology limitations**.**

(8 Hours)

Module – 3

Flexible RF receiver architectures:

Receiver architecture options, Single-Carrier Designs, implementation of a digital receiver: frequency up conversion using under sampling, achieving processing gain using oversampling, Noise figure, Receiver sensitivity, ADC spurious signals.

(8 Hours)

Module – 4

Multi-Band and General Coverage Systems:

Multiband Flexible receiver design. The problem of the Diplexer, RF Transmit/Receive Switch, Achieving Image rejection, Dynamic range enhancement, feedback and feed forward techniques.

(8 Hours)

Module – 5

Flexible transmitters and Power amplifiers:

Analog quadrature up conversion, Issues and Mitigations for an Analogue Quadrature Up convert Architecture, quadrature up conversion with interpolation, Interpolated band pass up conversion, Active All-pass filter.

Summary of the Course:

The student will be able to explore the concepts of Software Defined Radio for building communication system.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Understand requirements, benefits, Architecture for performance optimization and different models for Software Defined Radio.

CO2: **Apply** the knowledge of electronic circuits and principles of communication to solve the problems related to build SDR.

C03: **Analyse** the behaviour of RF signals and digital systems

CO4: **Design** circuits at different multi-rate signaling technique for frequency conversion and sampling issues.

Text books:

1. P Kenington, "RF and Baseband Techniques for Software Defined Radio", Artec House,2005

References :

1. Jouko Vanakka, "Digital Synthesizers and Transmitter for Software Radio", Springer,2005.
2. Wally H. W. Tuttlebee, "Software Defined Radio: Baseband Technologies for 3G Handsets and Base stations", John Wiley & sons, 2003.

Alternate Assessment Tools (AATs) suggested:

- Hands on transceiver design using GNU radio tool

Web links / e – resources:

- https://archive.nptel.ac.in/courses/117/107/108107107/

B.E ELECTRONICS & TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

5G Technology (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET743	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS: 03

Course objectives:

This course will enable students to

1. Understand the basics of 5G standardization phases, architecture and specification
2. Apply the knowledge of 5G Technologies to different applications
3. Analyse the performance of different 5G Technologies
4. Demonstrate the performance of 5G Technologies

Preamble:

5G technology heralds a new era in mobile connectivity, offering vastly improved speed, reduced latency, and greater network capacity compared to previous generations. This fifth generation of wireless technology is designed to support a burgeoning number of connected devices and enable advanced applications, such as autonomous vehicles and smart cities.

Module – 1

Overview of 5G Broadband Wireless Communications:
An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.
5G Key Technologies:
Small cells, massive MIMO, mm-Wave.

(8 Hours)

Module – 2

Small cells:
Past, present, and future trends of cellular networks coverage and capacity of small cell networks Interference management, D2D architecture Towards IoT Spectrum sharing.

(8 Hours)

Module – 3

Transmission and Design Techniques for 5G:
Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC).

Multiple Accesses Techniques :
orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

(8 Hours)

Module – 4

Massive MIMO:
Point-to-point MIMO, Virtual MIMO (relaying), multiuse MIMO Massive MIMO, propagation channel model, channel estimation, uplink and downlink data transmission capacity bounds, achievable rate, energy and spectral efficiency trade-off.

(8 Hours)

Module – 5

MM-Wave:
Applications, radio-wave propagation Physical layer design and algorithms mm-Wave MIMO challenges channel modelling channel estimation Beamforming.

(8 Hours)

Course outcomes:
The students will be able to:
CO1**: Apply** the knowledge of 5G Technologies to different applications
CO2**: Analyse** the performance of different 5G Technologies
CO3**:** Perform in group to demonstrate the concept of 5G technologies using modern tools

Text Books:

1. R. Vannithamby and S. Talwar, Towards 5G: Applications, Requirements and Candidate Technologies., John Willey & Sons, West Sussex, 2017.
2. Manish, M., Devendra, G., Pattanayak, P., Ha, N., 5G and Beyond Wireless Systems PHY Layer Perspective, Springer Series in Wireless Technology

Reference Books;

1. "Fundamentals of 5G Mobile Networks" Afif Osseiran, Jose. F.Monserrat, Patrick Marsch,
2. Cambridge University Press. 2019
3. T. S. Rappaport, R. W. Heath Jr., R. C. Daniels, and J. M. Murdock, Millimeter Wave Wireless Communication., Pearson Education, 2015
4. M. Vaezi, Z. Ding, and H. V. Poor, Multiple Access techniques for 5G Wireless Networks and Beyond., Springer Nature, Switzerland, 2019

Alternate Assessment Tools (AATs) suggested:
● Application projects

Web links / e – resources:

- https://www.qualcomm.com/5g
- https://www.ericsson.com/en/ran/network-performance

B.E ELECTRONICS & TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Wireless Sensor Networks (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET744	CIE Marks	50
Teaching Hours/Week (L: T: P)	**3:0:0**	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS: 03

Course objectives:

This course will enable students to

1. To understand the concept of wireless sensor node architecture
2. Acquire the knowledge of MAC and deployment strategies of WSN.
3. Learn different routing protocols required in the establishment of WSN.
4. Gain the knowledge of data centric and contained based networking

Preamble:

Wireless Sensor Networks (WSNs) are systems of spatially distributed sensors that monitor and record environmental conditions. These networks enable real-time data collection and analysis, offering significant benefits for applications.

Module-1

OVERVIEW OF WIRELESSSENSOR NETWORKS:

Single-Node Architecture - Hardware Components- Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks-Types of Wireless Sensor Networks.

(8hours)

Module-2

ARCHITECTURES:

Network Architecture- Senso rNetworks - Scenarios Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts, Operating Systems and Execution Environments-Introduction to TinyOSandnes C-Internet to WSN Communication

(8hours)

Module-3

NETWORKING SENSORS:

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wake up Concepts - SMAC, -B-MAC Protocol, IEEE 802.15.4 standard and Zig Bee, the Mediation Device Protocol, Wake up Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy- Efficient Routing, Geographic Routing.

(8hours)

Module-4

INFRASTRUCTURE ESTABLISHMENT:

Topology Control Clustering, Time Synchronization , Localization and Positioning, Sensor Tasking and Control

(8hours)

Module-5

SENSOR NETWORK PLATFORMS AND TOOLS:

Sensor Node Hardware–Berkeley Motes , Programming Challenges, Node level software platforms, Node level Simulators, State - centric programming.

(8hours)

Course Outcomes:

CO1 : Describe the overview of wireless sensor networks and enabling technologies for wireless sensor networks

CO2: Apply the knowledge of architecture, design principles and operating systems in establishing WSN

C03 : Select and analyse the appropriate infrastructure, topology, routing protocols required for WSN construction of WSN

CO4 : Analyze characteristics of protocols/algorithms/sensors required to establish a WSN

Text Books:

1. HolgerKarl&AndreasWillig,"ProtocolsandArchitecturesforWirelessSensorNetworks"JohnWiley,2005.
2. FengZhao&LeonidasJ.Guibas,"WirelessSensorNetworksAn Information Processing Approach", Elsevier, 2007
3. WaltenegusDargie,ChristianPoellabauer,"FundamentalsOfWirelessSensorNetworks-
4. TheoryA Practice", John Wiley& Sons Publications, 2011

Reference Books:

1. KazemSohraby,DanielMinoli,&TaiebZnati,"WirelessSensorNetworks-Technology,Protocols,and Applications", John Wiley, 2007.
2. AnnaHac,"WirelessSensorNetworkDesigns", JohnWiley,2003

Alternate Assessment Tools (AATs) suggested:

- Hands on experience on WSN using modern tool.

Web links / e – resources:

- http://pages.di.unipi.it/bonuccelli/sensori.pdf

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Cryptography and Network Security (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET745	CIE Marks	50
Teaching Hours/Week(L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand the basics of symmetric key and public key cryptography.
2. Apply the knowledge on standard algorithms used to provide confidentiality, integrity and Authenticity and various virus.
3. Analyze the various algorithms used to provide confidentiality, integrity and authenticity and various virus
4. Perform in a group to design and present applications of Network security with necessary tools.

Preamble:

Cryptography is the study of information and communication security. This course deals with prevailing weaknesses, vulnerabilities, attack methods and mitigation approaches in network security. The course focuses on Authentication, authorization, confidentiality, data integrity and non-repudiation, real time network security protocols and system security issues.

Module – 1

Introduction:

Network security, Significance of Security and services, Research in the field of Network security , Impact of Network security on societal problems and sustainable solutions.

Introduction to network security:

Attacks on Computers and Computer Security: Need for Security, Security Approaches, Principles of Security Types of Attacks. Security services. The OSI security architecture, A model for network security.

(9 Hours)

Module – 2

Symmetric Cipher Model:

Substitution Techniques, Transposition Techniques,Simple XOR, One-Time Pads, Simplified DES, Data encryption standard (DES), The strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of Operation, Evaluation Criteria for Advanced Encryption Standard, The AES Cipher.

(7 Hours)

Module – 3

Introduction to Public key Cryptography:

Number theory, Euclidean algorithm, Modular arithmetic, Prime Numbers, Fermat's and Euler's theorem. MD4 and MD5 , SHA 1 , One hash function , The RSA algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Authentication functions, Hash Functions.Digital Signature logarithmic . The ELGamal Cryptosystem, Digital Signature Algorithm, Elliptic Curves Cryptography- Key management, Session and Interchange keys, Key exchange and generation- PKI.

(**8 Hours)**

Module – 4

Transport Level Security:

Web Security Considerations, Secure Sockets Layer, Transport layer security, HTTPs, Secure Shell (SSH), IEEE 802.11i Wireless LAN E-mail Security: Secret Sharing Schemes, Kerberos , Pretty Good Privacy-S/MIME, IP security , LFSR, Hughes XPD/ KPD, Nanotech, Rambutan, Additive generators, Gifibrd, Algorithm M, PKZIP

(7 Hours)

Module – 5

Intruders:

Intrusion Detection, Password Management. Viruses and Related Threats, Virus Countermeasures. Firewalls: The Need for firewalls, Firewall Characteristics, Types of Firewalls, Firewall Biasing, Firewall location and configuration Firewalls Design Principles, Trusted Systems.

Summary of the Course:

The student will be able to explore the concepts, challenges and requirements of Network security and application of the same for Real time systems.

(9 Hours)

Course outcomes:

The students will be able to:

CO1: Understand the basics of Network security, attacks, services and mechanisms.
CO2: Understand the concept of web security and transport level security algorithms.
CO3: Use symmetric and asymmetric cryptography algorithms to encrypt and decrypt the data.
CO4: Apply concepts of modern algebra in cryptography algorithms.
CO5: Analyse the security mechanisms such as RSA, Diffie Hellman, key distribution management and Digital signatures.

Textbooks:

- William Stallings, "Cryptography and Network Security Principles and Practice", 6th Edition, Pearson Education Inc, 2014.
- Bruce Schneier, "Applied Cryptography Protocols, Algorithms, and Source code in C", Wiley Publications, 2nd Edition, ISBN: 9971-51-348-X

Reference:

- AtulKahate, "Cryptography and Network Security", TMH, 2003. Behrouz A. Forouzan, "Cryptography and Network Security", TMH ,2007.

Alternate Assessment Tools (AATs) suggested:

- Workshop on Network security

Web links / e – resources:

- https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
- https://aits-tpt.edu.in/wp-content/uploads/2023/08/Cryptography-and-Network-Security.pdf

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Medical Devices and Applications (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET751	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand basic fundamentals of medical instruments
2. Understand the bioelectric signals and recoders.
3. Learn the principles and steps involved in patient monitoring.
4. Apply medical imaging for biomedical applications.

Preamble:

The purpose of this course is to enable the students to appreciate the need for Biomedical Instrumentation and role of engineers in biomedical field. The course is conceptual in nature which allows the students to understand t the application of various engineering concepts used in biomedical for diagnosis, treatment and prevention of diseases.

Module – 1

Fundamentals of medical instrumentation:

Role of technology in medicine, landmark developments in biomedical instrumentation, physiological systems of the body, sources of biomedical signals, basic medical instrumentation system, performance requirements of medical instrumentation systems, intelligent medical instrumentation systems, consumer and portable medical equipment ,implantable medical devices micro-electro-mechanical systems (mems),wireless connectivity in medical instruments, general constraints in design of medical instrumentation systems, regulation of medical devices, role of engineers in healthcare facilities

(8 Hours)

Module – 2

Bioelectric Signals and Electrodes :origin of bioelectric signals, recording electrodes, silver-silver chloride electrodes, electrodes for ECG ,electrodes for EEG ,electrodes for EMG, electrical conductivity of electrode jellies and creams, microelectrode

(8 Hours)

Module – 3

Biomedical Recorders :

Origin of Bioelectric signals, polarization, depolarization, hyperpolarization. Propagation of Bioelectric potentials. Electrode tissue interface, surface and deep-seated Electrodes. ECG: Function of heart, conduction path way, placement of electrodes, lead configurations. Block Diagram of an Electrocardiograph. EEG: Introduction to EEG, 10-20 system of placement of electrodes, Block Diagram of Electroencephalograph, EMG: Introduction to EMG, Block Diagram of EMG recording, Introduction to EOG.

(8 Hours)

Module – 4

Patient monitoring systems:

System concepts, cardiac monitor, bedside patient monitoring systems, central monitors, measurement of heart rate, measurement of pulse rate, blood pressure measurement, measurement of temperature, measurement of respiration rate, Blood flow meter: blood flow measurement ,cardiac output measurement.

(8hours)

Module – 5

Introduction to medical imaging, Basics of diagnostics radiology, X-ray: Production of X-ray, X-ray Machine, application X-ray, CT: Basic Principle, CT Scan system components, Ultrasound: Principle of Ultrasound, Application of ultrasound in biomedical. MRI: Basic Principle, MRI Scan system components.

(8hours)

Course outcomes:

The students will be able to:

CO1:**Understand the** basic fundamentals of medical Instruments.

CO2:**Explain the** basic fundamentals of sensors CO3:.

Apply the knowledge of signal processing in handling medical intsructors.

CO4: **Analyze the** different parameters involved in biomedical applications

Textbooks:

1. R S Khandpur, "Handbook of Biomedical Instrumentation", McGraw Hill Education, 3rd edition, 2014.
2. J. Webster, "Medical Instrumentation: Applications and Design", John Wiley and Sons, 4th edition, 2009.

References:

1. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", Prentice Hall India Learning Private Limited, 1st edition, 1990.
2. Nandini K. Jog, "Electronics in Medicine and Biomedical Instrumentation", Prentice Hall India Learning Private Limited, 1st edition, 2013.

Alternate Assessment Tools (AATs) suggested:

- MATLAB, Lab VIEW for pre-processing the raw data and extraction of features using signal and image processing.
- MooC Courses on biomedical signal processing.

Web links / e – resources:

- https://nptel.ac.in/courses/108/105/108105101/
- https://www.coursera.org/learn/bioengineering
- https://www.udemy.com/course/biomedical-engineering-instrumentation-courserahbme216-rahsoft/

BMS Institute of Technology and Management

Choice Based Credit System (CBCS)

SEMESTER –VII (Open Elective)

Start-up Management (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code:	21HSS752	CIE Marks	50
Teaching Hours/Week (L: T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to: (List as per the requirement of your course)

1. Gain insight into the start-up environment, including key trends, challenges, and opportunities.
2. Develop the ability to design business plans.
3. Analyze start-up capital requirement and implementation.
4. Learn about the role of marketing in startup success.
5. Understand how to prepare a start-up for a successful exit.

Preamble:

This course is designed to equip aspiring entrepreneurs and business professionals with the skills, knowledge, and strategies needed to successfully launch a start-up. The course typically covers a range of topics, including ideation, business planning, financing, marketing, and exit strategies.

Module – 1

Introduction to start-ups - Start-up: definition, difference between Start-up founder and entrepreneur, Start-up ideas, different types of start-ups, identifying the start-up opportunities - idea generation meaning, 10 Steps to generating idea for successful startup, necessity of idea for innovation, stages from idea generation to idea implementation. challenges and success stories in start-ups.

Text Book: Steven Fisher, Ja-nae' Duane, The Start-up Equation -A Visual Guidebook for Building Your Start-up, Indian Edition, Mc Graw Hill Education India Pvt. Ltd, 2016.

Jyoti Gogte, Startup and New Venture Management, First Edition, Vishwakarma Publications, 2014.

(8 Hours)

Module – 2

Feasibility Analysis and Business Plan- Feasibility study – Meaning, reasons for conducting feasibility study. Business Plan – Definition, Purpose, Steps in Business plan – Executive Summary, General Company Description, Products and Services, Marketing Plan Operational Plan, Management and Organization, Financial Plan, Appendices.

Text Book: Jyoti Gogte, Startup and New Venture Management, First Edition, Vishwakarma Publications,2014. (**8 Hours)**

Module – 3

Eco-system supporting growth of startup – Funding options for Start-up ventures - Types of business funding, Venture Capitalist, Angel Investor and crowd funding, Director of Industries; DIC; SIDBI; SIDC; SISI; NSIC; NIESBUD**;** SIDCO; State Financial Corporation SFCS; Initiatives to promote Startups: Startup India Initiative, Startup India Seed Fund Scheme, Credit Guarantee Scheme for Startups (CGSS), Atal Innovation Mission (AIM), Pradhan Mantri Mudra Yojana (PMMY).

Text Book: Jyoti Gogte, Startup and New Venture Management, First Edition, Vishwakarma Publications, 2014. (**8 Hours)**

Module – 4

Marketing and its importance for Start-ups - Marketing concept, salient features, Elements of marketing mix, Methods of marketing, marketing channel – channel design, functions of channel design, marketing institutions – Marketing services offered by SIDO, Export promotion councils, e-commerce – benefits, future, Export possibility – institutional assistance to exporters.

Text Book: Vasant Desai, The dynamics of entrepreneurial development and Management, Sixth edition, Himalaya publication, 2018. **(8 Hours)**

Module 5

Business Sickness and Measures

Root cause of business failure, how to avoid failures, sickness in business- reasons, remedies, diagnosis, revival plan, role of concerning agencies, remedial measures closing and changing the business

Text Book: Jyoti Gogte, Startup and New Venture Management, First Edition, Vishwakarma Publications, 2014 **(8 Hours)**

Course Outcomes:

The students will be able to: -

CO1: Understand the basics concepts of start-ups
CO2: Comprehend the feasibility analysis and business plan requirements.
CO3: Analyze Eco-system supporting growth of startup
CO4: Develop effective marketing strategies for start-ups
CO5: Develop effective revival plan for start-ups.

Text Books:

1. Steven Fisher, Ja-nae' Duane, The Start-up Equation -A Visual Guidebook for Building Your Start-up,Indian Edition, Mc Graw Hill Education India Pvt. Ltd, 2016.
2. Jyoti Gogte, Startup and New Venture Management, First Edition, Vishwakarma Publications,2014.
3. Vasant Desai, The dynamics of entrepreneurial development and Management, Sixth edition, Himalaya publication, 2018.

Alternate Assessment Tools (AATs) suggested:

- **Business Plan:** Students should be asked to prepare a Business Plan and present it at the end of the semester.This should include the following:

Executive Summary, General Company Description, Products and Services, Marketing Plan Operational Plan, Management and Organization, Financial Plan, Appendices.

Web links / e – resources:

1. **https://www.my-mooc.com/en/mooc/entrepreneurship-strategy**
2. **https://www.my-mooc.com/en/mooc/new-venture-finance-startup-funding-for- entrepreneurs**
3. **https://www.my-mooc.com/en/mooc/how-to-finance-your-venture**
4. **https://core.ac.uk/download/pdf/98660713.pdf**

B.E IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Optical Fiber Networks (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET753	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course objectives:

Students should be able to

1. Learn the basic principle of optical fiber communication with different modes of light propagation.
2. Understand the transmission characteristics and losses in optical fiber.
3. Study of optical components and its applications in optical communication networks.

Preamble:

Optical fiber is used by telecommunications companies to transmit telephone signals, Internet communication and cable television signals. It is also used in other industries, including medical, Defense, Government, Industrial and Commercial.

Module – 1

Optical Fiber Communications: Historical development, The general system, Advantages of optical fiber communication, Ray theory transmission, Modes in planar guide, Phase and group velocity, Cylindrical fiber: Modes, Step index fibers, Graded index fibers, , Photonic crystal fibers.

(8 Hours)

Module – 2

Transmission characteristics of optical fiber

Attenuation, Material absorption losses, Linear scattering losses, Nonlinear scattering losses, Fiber bend loss, Dispersion, Chromatic dispersion

Optical Fiber Connectors:

Fiber alignment and joint loss, Fiber splices: Fusion Splices, Mechanical splices, Fiber connectors: Cylindrical ferrule connectors, , Fiber couplers: three and four port couplers, star couplers, Optical Isolators and Circulators.

(8 Hours)

Module – 3

Optical sources:

Light Emitting diodes and Laser diode Structures,

Photodetectors:

Physical principles of Photodiodes, Photo detector noise

Optical Receiver:

Optical Receiver Operation: Error sources. Front End Amplifiers,

(8Hours)

Module – 4

WDM Concepts and Components:

Overview of WDM: Operational Principles of WDM, Fiber grating filters, Dielectric Thin-Film Filters,. Optical amplifiers: Basic application and Types. Semiconductor optical amplifiers, Erbium Doped Fiber Amplifiers, Raman Amplifiers, Wideband Optical Amplifiers.

Module-5 Optical Networks:

Optical network transmission modes, layers and protocols: Synchronous networks, Asynchronous transfer mode, OSI reference model, Optical transport network, Internet protocol, Optical switching networks: Optical circuit switched networks, packet switched networks, Multiprotocol Label Switching, Optical burst switching networks, LAN, MAN, WAN.

(8Hours)

Course outcomes:

The students will be able to:

CO1: Classify and describe the working of Optical Fibre with different modes of signal propagation.

CO2: Apply the concepts of optics to solve problems related to Optical Fibre communication.

CO3: Classify the Optical sources and detectors based on the working principles

CO4: Analyze the networking aspects of Optical Fibers and various standards associated with it.

Text Book:

1. Gerd Keiser, "Optical Fibre Communications" 5th Edition, 2017

2. Joseph C Palais, "Fibre Optic Communication" 5th Edition, 2008

Reference:

1. Jim Hayes, "The Fibre Optic Association Guide to Fibre Optics Revolutionized Communications and
made broadband Possible", 2022

Alternate Assessment Tools (AATs) Suggested:

- Perform a group activity to demonstrate the need of Optical Fiber in communication by ppt presentation

Web links / e – resources:

- https://www.youtube.com/watch?v=jZOg39v73c4
- https://www.youtube.com/watch?v=N_kA8EpCUQo
- https://www.youtube.com/watch?v=fCX7U2oCWes

B.E IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Wireless Personal Area Network (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET754	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Credits :03

Course objectives:

Students should be able to

1. Learn the basic principle of GSM and CDMA evolution in Wireless systems
2. Understand the concepts of wire area network related to cellular networks.
3. Study the characteristics of Bluetooth, Zigbee, wireless sensor networks related to WPAN.
4. Analyse the applications related to WPAN with its architectural functionalities.

Module – 1

Preamble:

Wireless Personnel area networks are designed to facilitated Wireless Communication between devices in a close proximity, typically a range of few meters. They provides convenient and efficient means for connecting personal devices which are low power consumption.

Introduction:

Introduction to wireless cellular networks, Wide area networks, wireless PAN, Significance and scope of WPAN in current scenario, industry applications, research and innovations related to WPAN, impact of the course on societal problems.

Wide Area Wireless Networks (WANs) – GSM Evolution:

Introduction, GSM evolution for data, Third- Generation (3G) Wireless Systems.

Wide Area Wireless Networks (WANs)- CDMA One Evolution:

Introduction, CDMA 2000 Layering structure, Forward Link Physical channels of CDMA 2000, Reverse Link physical channels of CDMA 2000, Evolution of CDMA One (IS-95) to CDMA 2000.

(8 Hours)

Module – 2

Planning and Design of Wide Area Wireless Networks:

Introduction: Planning and Design of a Wireless Network, Radio Design for a Cellular Network, Receiver Sensitivity and Link Budget.

(8 Hours)

Module – 3

Wireless Application Protocol (WAP):

Introduction, WAP and the World Wide Web (WWW) , Introduction to Wireless Application Protocol, The WAP Programming Model ,WAP Architecture, WAP Advantages and Disadvantages Applications of WAP.

(8 Hours)

Module – 4

Wireless Personal Area Network – Bluetooth :

Introduction, The Wireless Personal Area Network, Bluetooth (IEEE 802.15.1),Definitions of the Terms Used in Bluetooth, Bluetooth Protocol Stack, Bluetooth Link Types, Bluetooth Security, Network Connection Establishment in Bluetooth, Network Topology in Bluetooth, Bluetooth Usage Models, Bluetooth Applications, WAP and Bluetooth.

(8Hours)

Module – 5

Wireless Personal Area Networks (WPAN):

Low Rate (LR) and High Rate (HR), Wireless Sensor Network, Usage of Wireless Sensor Networks, Wireless Sensor Network Model, Sensor Network Protocol Stack, ZigBee Technology, IEEE 802.15.4 LR-WPAN Device Architecture, Radio Frequency Identification.

Summary:

Students will be acquainted with Wireless network concept and WPAN applications related to present real word challenges.

Course outcomes:

The students will be able to:

CO1: Understand the basics of GSM and CDMA evolution in Wireless systems

CO2**: Apply** the concept of wide area network to solve the problems related to cellular networks.

CO3: Use the concept of networking, protocols, algorithms to establish a personal area network

CO3**: Analyse** the concepts of PAN programming, applications of wireless networks, Bluetooth, Zigbee,

wireless sensor networks with respect to their characteristics.

Textbooks:

1. Vijay Garg, "Wireless communication and Networking", First Edition, Elsevier Inc, 2007.

References:

1. Dr. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, "Wireless and Mobile Networks-Concepts and protocols", First Edition,Willey, 2004.

Alternate Assessment Tools (AATs) suggested:

● To perform in group to develop small applications

Web links / e – resources:

● https://www.ieee802.org/15/pub/PR/ACM_MC2R-80215.pdf

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Multimedia Communication (3:0:0) 3

(Effective from the academic year 2024-25 for 2021 Scheme)

Course Code	21ET755	CIE Marks	50
Teaching Hours/Week(L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand the different types of multimedia representation.
2. Learn the basic concepts text Audio, Video and Image Compression.
3. Get a detailed study of MPEG 4 AND MPEG 7 standards.
4. Familiarize the different types of multimedia networks.

Preamble:

Multimedia is the major source of information in today's era. The amount of digital data is increasing day by day. Audio, video and image signals require vast amount of data for its representation and storage. Compression of data is required to reduce the storage requirement, processing time and transmission time. This course enables the learner to study the various representations of multimedia such as text, audio, image and video. It deals with necessity and fundamentals of compression techniques, mechanisms and standards.

Module – 1

Introduction:

Multimedia communication, Significance of Multimedia communication, Research in the field of Multimedia communication, Impact of Multimedia communication on societal problems and sustainable solutions.

Multimedia communication:

Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, Network QoS, Application QoS.

(8 Hours)

Module – 2

Multimedia Information Representation:

Text, images, audio and video, Text and image compression, text compression, image compression.

(8 Hours)

Module – 3

Audio And Video Compression:

Audio and video compression, audio compression, video compression, video compression principles, video compression standards: H.261, H.263, P1.323, MPEG 1, MPEG 2, coding formats for text, speech, image and video.

(8 Hours)

Module – 4

Detailed study of MPEG 4:

Coding of audio visual objects, MPEG 4 systems, MPEG 4 audio and video, profiles and levels, MPEG 7 standardization process of multimedia content description.

(8 Hours)

Module – 5

Multimedia Communication across Networks:
Multimedia transport across IP networks and relevant protocols such as ARP & RARP, RTP and RTCP, Protocol Architecture ATMLANs.

Summary of the Course:
The student will be able to explore the concepts, challenges and requirements of Multimedia communication and application of the same for Real time systems.

(8 Hours)

Course outcomes:
The students will be able to:
CO1: Understand the different types of basic media.
CO2: **Apply** the different principles of compression to convert the text, audio and video in to multimedia standards.
CO3: Use networking protocols in implementing multimedia standards and communication
CO3: **Analyze** the different concepts of MPEG 4 and MPEG 7.

Textbooks:
1. Fred Halsall**, "**MultimediaCommunications: Applications, Networks, Protocols and StandardsAsia",
Second Indian reprint, Pearson Education, 2012
2. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, "Multimedia Communication Systems", Pearson education, 2014.

References:
1. Nalin K. Sharda**, "**Multimedia Information Networking",PHI, 2003.
2. Prabhat K. Andleigh and Kiran Thakrar, "Multimedia Systems Design", PHI,2014.

Alternate Assessment Tools (AATs) suggested:
- Applications based projects

Web links / e – resources:
- http://library.sitmng.ac.in/