



BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi) Avalahalli,
Yelahanka, Bengaluru-560119



Bachelor of Engineering

Department of Electronics and Telecommunication Engineering

VII Semester Scheme and Syllabus

2022 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 betterment of 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 syst



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BMS Institute of Technology and Management

(An Autonomous Institution, Affiliated to VTU Belagavi)

Avalahalli, Doddaballapur Main Road, Bengaluru, Karnataka – 560064

REVISED

Date: 18-12-2024

**CONTINUOUS INTERNAL EVALUATION (CIE)
AND
SEMESTER END EXAMINATION (SEE) PATTERN**

(Applicable to UG students admitted from the 2022 batch, effective from the Academic year 2024-25 onwards)

The UG students admitted from the 2022 batch onwards are hereby informed to note the following regarding Continuous Internal Evaluation and Semester End Examination pattern:

- The Weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%.
- The Minimum passing mark for the CIE is 40% of the Maximum marks (i.e. 20 marks out of 50) and for the SEE minimum passing mark is 35% of the Maximum marks (i.e. 18 out of 50 marks).
- A student will be declared to have passed the course if they secure a minimum of 40% (i.e. 40 marks out of 100) in the combined total of the CIE and SEE.

The following tables summarize the CIE and SEE Patterns for the courses of various credits:

IPCC COURSES: 4 CREDITS OR 3 CREDITS						
Evaluation Type		Internal Assessments (IAs)	Test/ Exam Marks Conducted for	Marks to be scaled down to	Min. Marks to be Scored	Evaluation Details
Theory Component	CIE – IA Tests	CIE – Test 1 (1.5 hr)	40	20	-	The sum of the two internal assessment tests will be 80 Marks and the same will be scaled down to 20 Marks .
		CIE – Test 2 (1.5 hr)	40			

	CIE – CCA (Comprehensive Continuous Assessment)	CCA	10	05	-	Any one assessment method can be used from the list appended below.
Total CIE Theory				25	10	
Practical Component	CIE - Practical		30	15	-	Each laboratory experiment is to be evaluated for 30 Marks using appropriate rubrics.
	CIE Practical Test		20	10	-	One test after all experiments to be conducted for 20 Marks
	Total CIE Practical			25	10	
Total CIE Theory + Practical				50	20	
SEE			100	50	18	SEE exam is a theory exam, conducted for 100 Marks , scored marks are scaled down to 50 Marks .
CIE + SEE				100	40	
The laboratory component of the IPCC shall be for CIE only.						

Professional Core Courses (PCC) / Engineering Science Courses (ESC): 03 and 02 Credit						
Evaluation Type		Internal Assessments (IAs)	Test/Exam Marks Conducted for	Marks to be scaled down to	Min. Marks to be Scored	Evaluation Details
Theory Component	CIE – IA Tests	CIE – Test 1 (1.5 hr)	40	30	-	The sum of the two internal assessment tests will be 80 Marks and the same will be scaled down to 30 Marks . Any Two assessment methods can be used from the list. If it is project-based, one CCA shall be given.
		CIE – Test 2 (1.5 hr)	40			
	CIE - CCAs	CCA	20	20	-	
	Total CIE Theory			50	20	
SEE			100	50	18	SEE is a theory exam, conducted for 100 Marks , scored marks are scaled down to 50 Marks .
CIE + SEE				100	40	

NON-IPCC COURSES: 01 Credit Course - MCQ


Evaluation Type		Internal Assessments (IAs)	Test/ Exam Marks Conducted for	Marks to be scaled down to	Min. Marks to be Scored	Evaluation Details
Continuous Internal Evaluation Component	CIE - IA Tests (MCQs)	CIE - Test 1 (1 hr)	40	40	-	<p>The question paper pattern for this course shall be an MCQ of 1 or 2 Marks (s).</p> <p>The questions with 2 Marks can be framed based on a higher Bloom's level.</p> <p>The sum of the two internal assessment tests will be 80 Marks, and the same will be scaled down to 40 Marks.</p>
		CIE - Test 2 (1 hr)	40			
	CIE - CCAs	CCA	10	10	-	Any One Assessment method can be used from the list provided below.
	Total CIE				50	20
SEE (MCQ Type)				50	18	<p>The question paper pattern for this course shall be an MCQ of 1 or 2 Marks (s).</p> <p>The questions with 2 Marks can be framed based on higher Bloom's level.</p> <p>MCQ-type question papers of 50 questions with each question of a 01 Mark, examination duration is 01 hour.</p>
CIE + SEE				100	40	

Professional Core Course Laboratory (PCCL) / Ability Enhancement Course Laboratory (AEC) - 01 Credit					
Evaluation Type	Internal Assessments (IAs)	Test/ Exam Marks Conduct ed for	Marks to be scaled down to	Min. Marks to be Scored	Evaluation Details
Continuous Internal Evaluation	CIE - Practical	30	30		Each laboratory experiment is to be evaluated for 30 Marks using appropriate rubrics.
	CIE - Practical Test	50	20		One test after all experiments is to be conducted for 50 Marks and to be scaled down to 20 Marks .
	Total CIE	-	50	20	
Semester End Examination		100	50	18	SEE to be conducted for 100 Marks .
CIE+SEE		100		40	

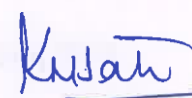
Learning Activities for CCAs:

A faculty member may choose the following CCAs 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 18/12/2024


Principal 18/12/24


Dean AA 18.12.24

Copy To:

1. The Vice-Principal, Deans, HoDs, and Associate HoDs
2. All faculty members and students of 2022, 2023, and 2024 batch.
3. Examination Section

VII Semester Scheme and Syllabus
2022 Scheme - Autonomous



BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institution Affiliated to VTU, Belagavi)

B. E. in Electronics and Telecommunication Engineering

Scheme of Teaching and Examinations – 2022 Scheme

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)

VII Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Credits Distribution				Examination				Contact Hours/week
					L	T	P	Total	CIE Marks	SEE Marks	Total Marks	SEE Duration (H)	
1	IPCC	BET701	5G Technology	TD: TE PSB: TE	3	0	1	4	50	50	100	3	5
2	PCC	BET702	Wireless Communication		3	0	0	3	50	50	100	3	3
3	PEC	BET703X	Professional Elective Course III		3	0	0	3	50	50	100	3	3
4	OEC	BET704X	Open Elective Course II		3	0	0	3	50	50	100	3	3
5	PW	BET705	Major Project Phase II		0	0	7	7	100	100	200	3	14
6	PCCL	BETL706	Wireless Communication Lab		0	0	1	1	50	50	100	3	2
TOTAL								21	350	350	700	-	

IPCC: Integrated Professional Core Course, **PCC:** Professional Core Courses, **PCCL:** Professional Core Course laboratory, **L:** Lecture, **T:** Tutorial, **P:** Practical, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation.

Professional Elective Course III

Open Elective Course II

Course Code	Course Name	Course Code	Course Name
BET703A	ASIC Design	BHSS704A	Start-up Management

BET703B	Cryptography and Network Security	BHSS704B	Organizational Behavior
BET703C	Software Defined Radio	BET704C	Medical Devices and Application
BET703D	Satellite Communication	BET704D	Wireless Personal Area Network

Integrated Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L: T: P) can be considered as (3: 0: 2) or (2: 2: 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this condition shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses (OEC): Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor.

Selection of an open elective shall not be allowed if,

- The candidate has studied the same course during the previous semesters of the program.
- The syllabus content of open electives is similar to that of the Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the program.

The minimum students' strength for offering open electives is 10. However, this condition shall not be applicable to cases where the admission to the program is less than 10.

Major Project Phase II:

The objective of the Project work is

- (i) To encourage independent learning and the innovative attitude of the students.
- (ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills.
- (iii) To impart flexibility and adaptability.
- (iv) To inspire teamwork.
- (v) To expand intellectual capacity, credibility, judgment and intuition.
- (vi) To adhere to punctuality, setting and meeting deadlines.
- (vii) To instill responsibilities to oneself and others.
- (viii) To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER–VII

5G Technology (3:0:1) 4

(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code	BET701	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to

1. Learn the evolution of wireless networks.
2. Get acquainted with the fundamentals of 5G networks.
3. Familiarize with the processes associated with 5G architecture.
4. Study network slicing and vehicular communication.
5. Acquire the knowledge on Multi-access edge computing and security in 5G networks.

Preamble:

The exponential growth of mobile data traffic, proliferation of smart devices, and the rising demand for ultra-low latency and high-speed connectivity have necessitated the evolution of mobile communication systems. 5G, the fifth-generation wireless technology, stands as a revolutionary leap that addresses these demands through enhanced capabilities and intelligent network design. This course is designed to provide students with a comprehensive understanding of the evolution, architecture, and functioning of 5G networks, emphasizing the technological advancements and practical use cases that define modern communication systems.

Module – 1**Evolution Of Wireless Networks:**

1G,2G,3G,4G and 5G, evolution of radio access networks, need for 5G, 4G versus 5G, Characteristics of 5G, Virtualized RAN (vRAN), Virtualized Evolved Packet Core(vEPC).

(Text 1) (08 Hours)**Module – 2**

5G Architecture: 5G System Architecture, 5G Deployment Architectures, Next Generation Core (NG-Core), Next Gen Radio Access Networks (NG-RAN), 5G New Radio (5G NR), Technologies accelerating 5G Radio, Small Cells.

(Text 1) (08 Hours)**Module – 3**

Introduction To 5G Network Slicing: Network Slicing, E2E Slicing, SDN and NFV Slicing.

Vehicular Communications: From V2V to V2X, key standards, VC architectures, V2X Use cases.

(Text-2) (08 Hours)**Module – 4**

Multi-access Edge Computing (MEC) and Security in 5G Networks: Need for MEC, MEC Architecture, MEC Deployment modes, MEC Deployment scenarios in 5G Network, Integrating MEC with 5G Networks, MEC Use Cases, Benefits of MEC. Need for Security in 5G networks, Security features in 5G network, Mitigating the threats in the 5G Network.

(Text 1) (08 Hours)**Module – 5**

5G - Use cases: Enhanced Mobile Broadband (eMBB), Fixed Wireless, Robotic Surgery, Massive IOT, Private Wireless Network, Autonomous Cars, Virtual Reality (VR) / Augmented Reality (AR).

(Text 1) (08 Hours)**Summary of the Course:**

Course covers the fundamentals of 5G network architecture, network slicing Multi-access edge computing, security in 5G networks and 5G-use cases.

Course Outcomes: This course will enable students to

CO1: Understand the evolution of wireless networks.

CO2: Apply the concepts of core network, new radio, cloud technologies, and radio access methods to 5G.

CO3: Apply the concept of 5G architecture, Network slicing and V2X communication to 5G Use cases.

CO4: Apply the impact of Multi-access Edge computing and security in 5G networks

Textbooks:

1. “An Introduction to 5G Wireless Networks : Technology, Concepts and Use cases”, Saro Velrajan, KDP ISBN: 9798643303107, First Edition, 2020.
2. “5G Mobile Communications Concepts and Technologies”, Saad Z. Asif, CRC Press, Taylor & Francis Group, First Edition, 2018

References:

1. “Network Function Virtualization Concepts and Applicability in 5G Networks”, Ying Zhang, John Wiley & Sons, 2018.
2. “5G system Design: An end to end Perspective” , Wan Lee Anthony, Springer Publications, 2019.

Practical Exercises:

Simulation Using MATLAB

1. Write a program to perform 5G-Compliant waveform generation and testing.
2. Write a program to perform Modeling of 5G Synchronization signal blocks and bursts.
3. Write a program to perform Channel modeling in 5G networks.
4. Write a program to perform Multiband OFDM demodulation.
5. Write a program to perform Perfect Channel estimation.
6. Write a program to perform Development of 5g New Radio Polar Coding.

Content Beyond Syllabus:

1. OFDM waveform Configuration, Constellation diagram Using MATLAB.
2. QAM waveform Configuration, Constellation diagram Using MATLAB.
3. PSK waveform Configuration, Constellation diagram Using MATLAB.

Alternate Assessment Tools (AATs) suggested:

Implementation of 5G concepts to solve societal problems using modern tools, Submit the report as part of course.

Web links / e – resources:

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

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER–VII

Wireless Communication (3:0:0) 3

(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code	BET702	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:

1. This course will enable students to
2. Understand the basics of wireless communication and 4G standardization phases and specifications.
3. Explain the system architecture of 4G.
4. Analyse the role of LTE radio interface protocols to setup, reconfigure and release the Radio Bearer for transferring the EPS bearer.
5. Analyse the main factors affecting LTE performance including mobile speed and transmission bandwidth.

Introduction: Evolution of wireless communication, Significance and Scope of the course in economic growth of Nation, Impact of the course on Societal Problems, Career Perspective, Innovations, Research status/trends.

Module – 1

The Cellular Concept–System Design Fundamentals: Frequency reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity. Trunking and Grade of Service.

Basic Propagation Mechanism : Reflection (Ground Reflection), Diffraction, Scattering.

Small Scale Fading and Multipath: Small Scale Multipath Propagation, Impulse Response of Multipath Channel, Parameters of Mobile Multipath Channels, Types of Small-scale Fading, Rayleigh and Rician Distributions. **(08 Hours)**

Module – 2

Key Enablers for LTE features: OFDM, Single carrier FDMA, Single carrier FDE, Channel Dependent Multiuser Resource Scheduling, IP based Flat network Architecture, LTE Network Architecture.

Multicarrier Modulation: OFDM basics, OFDM in LTE, Timing and Frequency Synchronization, PAR, SC-FDE.

OFDMA and SC-FDMA: OFDM with FDMA, TDMA, CDMA, OFDMA, SC-FDMA, OFDMA and SCFDMA in LTE. **(08 Hours)**

Module – 3

Overview and Channel Structure of LTE: Introduction to LTE, Channel Structure of LTE, Downlink OFDMA Radio Resource, Uplink SCFDMA Radio Resource.

Downlink Transport Channel Processing: Overview, Downlink shared channels, Downlink Control Channels, Broadcast channels, Multicast channels **(08 Hours)**

Module – 4

Uplink Channel Transport Processing: Overview, Uplink shared channels, Uplink Control Information, Uplink Reference signals, Random Access Channels, H-ARQ on uplink.

Physical Layer Procedures: Hybrid– ARQ procedures, Channel Quality Indicator CQI feedback, Random Access Procedures. **(08 Hours)**

Module – 5

Radio Resource Management and Mobility Management: PDCP overview, MAC/RLC overview, RRC overview, Mobility Management. **(08 Hours)**

Summary of the Course: Course covers the fundamentals of wireless Communication, The concepts of LTE in detail are discussed.

CO1: Understand the basics of wireless communication, system architecture and the functional standards specified in LTE 4G.

CO2: Apply the knowledge of multicarrier modulation to LTE.

CO3: Apply the knowledge of uplink and downlink transport protocols along with radio resource and mobility management to LTE

CO4: Analyze the role of LTE radio interface protocols and EPS Data convergence protocols to set up, reconfigure and release data and voice from users.

Textbooks:

1. “Wireless Communications: Principles and Practice” Theodore Rappaport, Prentice Hall Communications Engineering and Emerging Technologies series, 2nd edition, 2002.
2. “Fundamentals of LTE”, Arunabha Ghosh, Jan Zhang, Jefferey Andrews, Riaz Mohammed Prentice Hall, 2018

References:

1. “LTE for UMTS Evolution to LTE Advanced”, Harri Holma and Antti Toskala, Second Edition, John Wiley & Sons, Ltd. 2011.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER–VII

ASIC Design (3:0:0) 3

(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code	BET703A	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. Learn the ASIC methodologies and programmable logic cells to implement a function on IC.
2. Understand the issues and tools related to ASIC design and implementation
3. Acquire the knowledge of physical design and partitioning methods
4. Summarize the floor planning, placement and routing techniques

Module – 1**Introduction to ASICs:**

Types of ASICs: Full Custom ASICs, Standard Cell based ASICs, Gate array based ASICs, Channeled gate array, Channel less gate array, structured gate array, Programmable logic devices, Field Programmable Gate Arrays, Design Flow,

Data logic cells: Data Path Elements, Adders, Multipliers, Arithmetic operator. (Practical approach). I/O Cell, Cell Compilers. **(8Hours)**

Module – 2**ASIC Library Design:**

Logical effort: predicting delay, logical area and logical efficiency, logical paths, multistage cells, optimum delay, optimum no. of stages. Library cell design.

Programmable ASICs: The Antifuse, Static RAM, EPROM and EEPROM technology. **(8Hours)**

Module – 3**Programmable ASICs logic cells:**

Actel ACT: ACT1 logic module, Shannon's expansion theorem, Multiplexer logic as function generators, Timing models and critical path, speed gating, worst case timing.

Programmable ASIC Design Software: Design System, logic synthesis, Introduction to Synthesis and Simulation.

Low- Level Design Entry: Schematic Entry: Hierarchical design. The cell library, Names, Schematic, Icons & Symbols, Nets, schematic entry for ASIC'S, connections, vectored instances and buses, Edit in place attributes, Netlist, screener, Back annotation. **(8Hours)**

Module – 4

ASIC Construction: Physical Design, CAD Tools, System Partitioning, Estimating ASIC size, Power dissipation, FPGA partitioning.

Partitioning methods: partitioning example, Constructive Partitioning, Iterative Partitioning Improvement, Kernighan algorithm, The ratio-cut algorithm, Look Ahead algorithms. **(8Hours)**

Module – 5**Floor Planning and Placement & Routing:**

Floor planning: Floor planning goals, Floor planning tools, I/O and power planning, clock planning.

Placement: Placement goals, algorithms, iterative placement improvement, Time driven placement methods. Physical Design flow.

Routing: Global Routing goals and methods, Detail Routing, Left edge algorithm, Area routing algorithm, Special Routing, Circuit Extraction and DRC. **(8Hours)**

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1: Understand the types of ASICs, VLSI design flow and data logic cells.

CO2: Analyze the design parameters for speed, area, power optimization and FPGA programming technologies for design of ASICs

CO3: Apply the features of logic cells, FPGA design flow and design entry required for ASIC design
CO4: Analyze the importance of system partitioning and its methods in physical design
CO5: Apply the back-end physical design flow, including floor planning, placement and Routing techniques.

Suggested Learning Resources:

Text Books:

1. “Application -Specific Integrated circuits”, M J S Smith Pearson Education, Seventh impression 2010.

References:

1. “VLSI Design: A Practical Guide for FPGA and ASIC Implementations” ,Vikram Arkalgud Chandrasetty, Springer, ISBN: 978-1-4614-1119-2. 2011
2. “An ASIC Low Power Primer”, Rakesh Chadha, Bhasker J Springer, ISBN:978-14614-4270-7.J.Rabaey,

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ee77/preview.
2. <https://www.scribd.com/document/482509792/ASIC-Lab>

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 2025-26 for 2022 Scheme)

Course Code	BET703B	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: Need for Security, Security Approaches, Types of Attacks, Security services, The OSI security architecture, A model for network security.

Symmetric Cipher Model: Simplified Model of Symmetric Encryption, Cryptography, Cryptanalysis and Brute-Force Attack. Substitution Techniques: Ceaser cipher, Hill cipher, Play fair, cipher, Monoalphabetic and poly alphabetic cipher, One-Time Pads , Transposition Techniques. **(8 Hours)**

Module – 2

Block Ciphers and the Data Encryption Standard: Simplified DES, Data encryption standard (DES), Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of Operation, **Advanced Encryption Standard:** AES Structure, AES Transformation Functions, AES Key Expansion **(8 Hours)**

Module – 3

Introduction to Public key Cryptography: Public-Key Cryptosystems, The RSA algorithm, Diffie–Hellman Key Exchange, ElGamal Cryptographic System, Elliptic Curve Cryptography

Cryptographic Hash Functions: Message Authentication, Digital Signatures, Two Simple Hash Functions, Secure Hash Algorithm (SHA), The Digital Signature Algorithm (DSA) **(8 Hours)**

Module – 4

Transport Level Security: Web Security Threats, Web Traffic Security Approaches, Transport Layer Security: TLS Architecture, TLS Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, HTTPS.

Secure Shell (SSH): Transport Layer Protocol, User Authentication Protocol, Connection Protocol, Secure/Multipurpose Internet Mail Extension, IP security architecture. **(8 Hours)**

Module – 5

Intruders: Intrusion Detection system, Password Management, Taxonomy of Malicious software (malware), Viruses and Related Threats, Virus Countermeasures.

Firewalls: The Need for firewalls, Firewall Characteristics, Types of Firewalls, Firewall Biasing, Firewall configuration, Trusted Systems. **(8 Hours)**

Course outcomes:

The students will be able to:

CO1: Apply symmetric cryptography algorithms to encrypt and decrypt the data

CO2: Apply classical block cipher algorithms such as DES and AES for secure data encryption

CO3: Analyse security mechanisms such as RSA, Diffie Hellman, key distribution management and Digital signature.

CO4: Understand the concept of web security and transport level security algorithms

CO5: Analyse security mechanisms such as RSA, Diffie Hellman, key distribution management and Digital signature.

Textbooks:

1. “Cryptography and Network Security Principles and Practice”, William Stallings, 6th Edition, Pearson Education Inc, 2014.
2. “Applied Cryptography Protocols, Algorithms, and Source code in C”, Bruce Schneier, Wiley Publications, 2nd Edition, ISBN: 9971-51-348-X, 2007.

Reference:

1. “Introduction to Cryptography and Network Security”, Behrouz A. Forouzan, McGraw Hill Education, 2003.
2. “Cryptography and Network Security”, Atul Kahate, McGraw Hill Education , 2007.

Alternate Assessment Tools (AATs) suggested:

1. Literature Review and Mini project using Modern tools

Web links / e – resources:

1. https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
2. <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**Software Defined Radio (3:0:0) 3**

(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code	BET703C	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 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. **(8 Hours)**

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

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.

CO3: 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. "RF and Baseband Techniques for Software Defined Radio", Peter B. Kenington, Artech House, 2005.

References:

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

Alternate Assessment Tools (AATs) suggested:

1. Hands on transceiver design using GNU radio tool

Web links / e – resources:

1. <https://archive.nptel.ac.in/courses/117/107/108107107/>

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Satellite Communication (3:0:0) 3

(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code	BET703D	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. **(9 Hours)**

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.

Course outcomes:

The students will be able to:

CO1: Understand the fundamentals of satellite communication and remote sensing.

CO2: Apply basic knowledge of space communication, multiple access methods for satellite link and transmission.

CO3: Use the knowledge of different laws, electromagnetics, for space communication and remote sensing.

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

Textbooks:

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

Reference Books:

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

Alternate Assessment Tools (AATs) suggested:

1. Students have to provide oral presentation of Satellite Communication

Web links / e – resources:

1. <https://ernet.in/content/vsat-communication-services>
2. <https://www.cgi.com/en/space/satellite-communications>
3. <http://www.rsi.ca>
4. <http://www.npagroup.com/>

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VII (Open Elective)

Start-up Management (3:0:0)

(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code:	BHSS704A	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. “The Start-up Equation -A Visual Guidebook for Building Your Start-up”, Steven Fisher, Janae’ Duane, Indian Edition, Mc Graw Hill Education India Pvt. Ltd, 2016.
2. “Startup and New Venture Management”, Jyoti Gogte, First Edition, Vishwakarma Publications,2014.
3. “The dynamics of entrepreneurial development and Management”, Vasant Desai, 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>
<https://core.ac.uk/download/pdf/98660713.pdf>

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING			
Choice Based Credit System (CBCS)			
SEMESTER – VII (Open Elective)			
Organizational Behavior (3:0:0) 3			
(Effective from the academic year 2025-26 for 2022 Scheme)			
Course Code	BHSS704B	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:			
<ol style="list-style-type: none"> 1. To know and recognize the importance of human behaviour at work in organizations. 2. To relate human behaviour with learning and demonstrate how the two go together. 3. To recognize the importance of motivation in learning and other performance attributes. 4. To know and locate the importance of group interactions and group behaviour in organizations. 5. To manage and resolve conflicts through effective communication 			
Preamble: Organizational behaviour and its impact focuses on the individual factors such as personality, attitude, learning, perception, motivation and ability with respect to organizational behaviour and commitment			
Module – 1			
Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems). The Individual: Foundations of individual behaviour, individual differences. Ability. Attitude, Aptitude, interests. Values – Types of Values, changing Values. (8 Hours)			
Module – 2			
Learning: Theories of learning, individual decision making, classical conditioning, operant conditioning, social learning theory, continuous and intermittent reinforcement. Perception: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect. (8 Hours)			
Module – 3			
Motivation: Maslow's Hierarchy of Needs theory, Mc-Gregor's theory X and Y, Herzberg's motivation Hygiene theory, David McClelland's three needs theory, Victor Vroom's expectancy theory of motivation. (8 Hours)			
Module – 4			
Groups Behavior: Classification of groups, Factors affecting group formation, stages of group development, Norms, Hawthorne studies, group processes, group tasks, group decision making (8 Hours)			
Module – 5			
Conflict & Stress Management: Functional and dysfunctional conflict, stages of conflict process. Sources of stress, fatigue and its impact on productivity. Job satisfaction, job rotation, enrichment, job enlargement and reengineering work process.			
Communication: Principles of Communication: Useful definitions, communication principles, communication system, role of communication in management, barriers in communication, how to overcome the barriers, rule of effective communication (8 Hours)			
Course outcomes:			
This course will enable students to:			
<ol style="list-style-type: none"> 1. Illustrate human behavior at work. 2. Analyse how learning depends on behavioral aspects. 3. Describe Value motivation and work and demonstrate their motivational skills. 4. Assess to manage organizational conflict and be able to produce results 			

Textbooks:

1. "Organizational Behaviour", Stephen P Robbins, 9th Edition, Pearson Education Publications, ISBN-81-7808-561-5 2002.
2. "Organizational Behaviour", Fred Luthans, 9th Edition, Mc Grew Hill International Edition, ISBN- 0-07-04-002.

Reference Books:

1. "Organizational Behaviour", Aswathappa - Himalaya Publishers, 2001.
2. "Organizational Behaviour", (Human behaviour at work) 9th Edition, John Newstrom/ Keith Davis, 2002.
3. "Organizational Behaviour", Hellriegel, Srocum and Woodman, Thompson Learning,

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERINGChoice Based Credit System (CBCS)
SEMESTER – VII (Open Elective)**Medical Devices and Applications (3:0:0) 3**
(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code	BET704C	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 recorders.
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 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 instructors.

CO4: Analyze the different parameters involved in biomedical applications

Textbooks:

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

References:

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

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VII (Open Elective)

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

(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code	BET704D	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. **(8 Hours)**

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. **(8 Hours)**

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. “Wireless communication and Networking”, Vijay Garg, First Edition, Elsevier Inc, 2007.

References:

1. “Wireless and Mobile Networks- Concepts and protocols”, Dr. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, 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

Wireless Communication Laboratory (0:0:1) 1

(Effective from the academic year 2025-26 for 2022 Scheme)

Course Code	BETL706	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	03

Note: Conduct the following experiments to implement the indication communication process by simulation using MATLAB or any equivalent tool.

Laboratory Experiments

1. Develop a code to represent the different channel models for wireless networks
2. Develop a code to compute the Path loss, Link Budget and sketch relevant plot
3. Analysis of cellular concepts like cell-sectoring, splitting (using Quannet/NS3/ any other tool)
4. To consider 2 to 4 message signals, and obtain the Time Division-Multiplexed waveform and then perform de multiplexing and get back the original message signals (represent the signals in time domain and frequency domain at various stages)
5. Consider 24 message signals, and obtain the T1 carrier bit stream (represent the signal in time domain and frequency domain at various stages)
6. Consider the irreducible polynomial of order N (3 or 4) and obtain the 2^N-1 Codes, for the CDMA system. Build the Spread Spectrum modulating using any one of the valid codes.
7. To verify the correlation properties of the codes developed for the CDMA.
8. To build the BPSK-OFDM modulated waveform for binary input data stream and cover the message signals from the modulated waveform.
9. To build the QPSK-OFDM modulated waveform for binary input data stream and recover the message signals from the modulated waveform.
10. To build the GMSK modulated waveform for binary input data stream and recover the message signals from the modulated waveform.

Conduct of practical examination

- All laboratory experiments are to be included for practical examination.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change the experiment is allowed only once and marks allotted to the procedure part to be made zero.

Course outcomes: The students will be able to

CO1:	Conduct experiments to measure different parameters related to Wireless Communication
CO2:	Write a report for the conducted experiment.
CO3:	Conduct open ended experiments related to 4G LTE