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

V and VI Semester Scheme and Syllabus

2021 Scheme - Autonomous

Approved in the BoS meeting held on 27.05.2023

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 systems

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(An Autonomous Institution affiliated to VTU, Belagavi)
Yelahanka, Bengaluru-560064

Date: 14.06.2023

CIE and SEE Pattern for 2021 Scheme
(Applicable from the AY 2021-22 onwards)

Important Note:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examinations (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for SEE minimum passing mark is 35% of the maximum marks (18 marks out of 50). The student is declared as a pass in the course if he / she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

4 CREDIT and 3 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs to be conducted for 40 Marks (90 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10 marks, total **20 marks**.
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score 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 from each module.**

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: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks**.
- Assignments: 2 assignments of each 10marks, total **20 marks.**
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score 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.

1 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10marks, total **20 marks.**
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score 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 COURSES

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 minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks and scale down to 50 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.

CoE 16/06/2023 Dean AA 16/06/2023 Principal 19/6/23

Scheme of V Semester

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: ELECTRONICS & TELECOMMUNICATION ENGINEERING (ETE) — **Semester: V**

Sl. No	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration Hrs.	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS51	Management and Entrepreneurship	ETE	3	0	0	0	3	3	50	50	100
2	AEC	21AEC52	Cyber and Intellectual Property Law	ETE	0	2	0	0	1	1	50	50	100
3	INT	21INT53	Innovation / Entrepreneurship / Societal Internship	ETE	0	0	0	6	3	-	100	-	100
4	PE	21ET54X	Professional Elective - I	ETE	3	0	0	0	3	3	50	50	100
5	PC	21EC55	Signal Processing	ETE	2	2	0	0	3	3	50	50	100
6	PC	21EC56	Advanced Electromagnetics	ETE	3	0	0	0	3	3	50	50	100
7	PC	21ET57	VLSI & Embedded Controller	ETE	3	2	0	0	4	3	50	50	100
8	PC	21ECL58A	Signal Processing Laboratory	ETE	0	0	2	0	1	3	50	50	100
9	PC	21ETL58B	VLSI & Embedded Controller Laboratory	ETE	0	0	2	0	1	3	50	50	100
TOTAL					**14**	**6**	**4**	**6**	**22**		**500**	**400**	**900**

Professional Elective - Group I	
Course Code	**Course Title**
21ET541	Automotive Electronics
21ET542	Information Theory and Coding
21ET543	Electronic Product development
21ET544	Optical Networks
21ET545	OOPs Using C++

Syllabus of V Semester

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Management and Entrepreneurship (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21HSS51	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. Define the strategic, tactical, and operational roles and functions of management.
2. Use critical thinking to formulate and execute managerial entrepreneurial strategies,plans, and procedures.
3. Understand the Ideation Process, creation of Business Model, Feasibility Study andsources of funding

Module – 1

Management: Significance and Scope of Management, Importance of the management and entrepreneurship in Economic growth of Nation, Impact of the entrepreneurship on Societal Problems for Sustainable Solutions. Management in the perspective of National Economy, Career, Innovations and trends. Definition, Management functions, Levels of management, Roles of manager, Managerial skills, Management & Administration.

Planning: Importance, Types, Steps and Limitations of Planning; Decision Making types and Steps in Decision Making.

(8 Hours)

Module – 2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management, Departmentalization.

Committees: Meaning, Types of Committees; Centralization Vs Decentralization of Authority,Responsibility. Staffing: Importance, Recruitment and Selection Process.

Directing and Controlling: Meaning and Requirements of Effective Direction.

Motivation: Nature of Motivation, **Motivation Theories** (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory). **Communication:** Meaning, Importance and Purposes of Communication. **Leadership:** Meaning, Characteristics, Behavioral Approach of Leadership. **Coordination:** Meaning, Types, Techniques of Coordination; **Controlling:** Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, and Steps in Control Process.

(8 Hours)

Module – 3

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship. Theories of Entrepreneurship.

(8 Hours)

Module – 4

Entrepreneurial Project Development: Idea Generation and Feasibility Analysis- Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.
(Case study/Activity to demonstrate entrepreneurial abilities)

(8 Hours)

Module – 5

Social Responsibilities of Business: Meaning of social responsibility, social responsibilities of business towards different groups, social audit, business ethics and corporate governance.

Self-study topics:

1. Sources of funding, Working capital management and Taxation benefits.
2. Market evaluations and turnaround strategies.
3. Policies governing SME's
4. Perform market survey on sectors promoted by the government and submit the report forthe same.

   Summary: The student will explore entrepreneurial opportunities and gather all relevant data for starting a venture.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Comprehend the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business
CO2: Categorise the functions of Managers, Entrepreneurs and their social responsibilities
CO3: Analyse the business environment components in developing a business plan.
CO4: Individually and in teams identify, conceptualize, and develop solutions for successful entrepreneurial management.

Textbooks:

1. P. C. Tripathi., P. N. Reddy., "Principles of Management." 6th Edition, McGraw-HillEducation, 2017.
2. Dr. Vasant Desai. "Dynamics of Entrepreneurial Development and Management", 6th Edition,Himalayan Publishing House, 2019.

References:

1. Poornima. M. Charantimath., "Entrepreneurship Development Small BusinessEnterprises", Pearson Education, 2008.
2. Robert. D. Hisrich., Mathew. J., Manimala., Michael. P. Peters., Dean. A., Shepherd, "Entrepreneurship", 8th Edition,Tata McGraw Hill Publishing Co. ltd, 2012.
3. Harold Koontz, Heinz Weihrich., "Essentials of Management: An International, Innovation
   and Leadership perspective", 10th Edition, McGraw Hill Education, 2016.

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING
Choice Based Credit System (CBCS)
Semester – V

Cyber and Intellectual Property Law (0:1:0)1
(Common to all Branches)
(Effective from the academic year 2021-22)

Course Code	21AEC52	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:2:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	1

Course Objectives:

This course will enable students to:

1. Understand the concept of IP, copyright, patent and its protection.
2. Explain the scope of trademarks, industrial and IC layout design.
3. Enhance their knowledge on IP management and related agreements.
4. Understand overview of Cyber law and cyber policies.
5. Identify different types of cybercrime and security measures.

Module – 1

Introduction to IP: Various forms of IP, Intellectual property verses physical property, importance of intellectual property.
Copyright: Different classes of copyright work, ownership of copyright, term of copyright, infringement of copyright.
Patent: Fundamentals of patent, condition for grant of patent, inventions those are not patentable, right of patentee, transfer of patent right, Infringement of patent right, challenges in patents. Case study on prior art search and patent drafting.

(3 Hours)

Module – 2

Trademarks: Introduction to trademark, developing trademark, term of trademark, collective marks, certification trademarks, Infringement of trademark.
IC Layout Design Introduction to Semi-Conductor Integrated Circuits Layout, The Semi-Conductor Integrated Circuits Layout Design (SICLD) Act, 2000.
Industrial Design: Design registration, Industrial design act 2000.
Case study on infringement of Industrial Design

(3 Hours)

Module – 3

Creating IP: Need for creating IP, Process of development of IP and knowledge.
TRIPS (Trade-Related aspects of IPR): Need and objectives, Agreement on trip, scheme of agreements. WIPO: Objectives, functions, memberships
Treaties: Patent cooperation Treaty(PCT)**:** filing patent under PCT, Different stages and procedure in PCT filing. Paris Convention Treaty**:** filing patent under Paris convention treaty, Different procedure stages
IP Management: Defining IP management, need and importance of IP management,
. Undertaking IP intelligence, acquisition of IP, managing IP portfolio, commercialisation of IP, protecting IP. Case studies on PCT filing.

(3 Hours)

Module – 4

Cyber Law: introduction to Indian cyber law, need for cyber law, jurisprudence of cyber law, importance of cyber law.

IT Act: Objective and scope of The Indian Information Technology Act 2000.

Cyber Crimes: What constitute cyber crime, Important cybercrimes.

C**yber policies:** Need for an information security policy, information security standard-ISO, introduction to various security policies. Case study on cyber crime.

(3 Hours)

Module – 5

Phishing; Sspear phishing, protecting from phishing attack, cyber stalking, how to prevent cyber stalking.

Hacking: types, Protection of computers from intrusion and types, different types of hackers and their operation.

Data theft: IT act related to data theft, Spam E-mail, IT act related to spam mail, Software piracy, types, legal penalties, Identity theft, prevention practice

Electronic and digital signature: Role of electronic signature, types of electronic signature, guidelines for electronic signature. Creation of digital signature, digital signature in India.

(3 Hours)

Course Outcomes:

The students will be able to:

CO1: Describe the concept of copyright and patent and its protection.

CO2: Explain the scope of trademarks, industrial and IC layout design.

CO3 Describe Intellectual property management and related agreements.

CO4: Understand overview of Cyber law and cyber policies.

CO5: Discuss different types of cybercrime and security measures.

Text Books

1 V Appukutty, Cyber Crime & Law, Coral Publishers, 2022

2 Surya Prakash Tripati, Ritendra Goel, Praveen Kumar Shukla, Introduction to information Security and Cyber Laws, Dream Tech Press,2021

3 Neeraj Pandey, Khushdeep Dharni, Intellectual Property Rights, PHI Learning, 2014

References

1 Prabhuddha Ganguli, Intellectual Property Rights, Tata Mc-Graw –Hill, 2017

2 S R Myneni, Patent Right Creation and Registration, Asia Law House, 2017

3 Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, Pearson, 3rd Edition, 2004.

4 Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Cengage Learning, 4th Edition, 2010.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER - V

Innovation / Entrepreneurship/ Societal Internship (0:0:0:3) 3
(Common to all Branches)
(Effective from the academic year 2021-22)

Course Code	21INT53	CIE Marks	100
Teaching Hours/Week (L:T:P:PW)	0:0:0:6	SEE Marks	--
Total Number of Contact Hours	4 weeks	Exam Hours	--

Schedule:
Scheduled during the intervening period of IV and V semester

During the intervening period of IV and V semesters, students shall be ready for industrial experience. Therefore, they shall choose to undergo Internship involving Innovation / Entrepreneurship/Societal related activities. Students may choose to work on innovation or entrepreneurial activities or both resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case students want to undergo internship at his/her family business, he /she shall will be permitted provided, a declaration by a parent is submitted directly to the Principal of the institution.

Innovation:
Innovation refers to a new or improved product or process or a combination thereof that differs marginally or significantly from the unit's previous product. An innovation center is a place where students are encouraged to implement the innovative ideas formed through imagination, brainstorming sessions, design thinking and associated activities to bring them to reality. It is a place, where creative minds are shaped.

Entrepreneurship:
Entrepreneurship refers to setting up a new business or businesses, taking on financial risks inthe hope of profit. It involves investment to undertake production along with arranging inputs like land, labour, material and capital, introducing new techniques and products, identifying new sources for the enterprise, etc.

Incubation Center:
An organized unit designed for innovation as well as to accelerate the growth and success of new entrepreneurial companies through mentorship and an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections.

Startup:
An entity that develops a business model based on either product innovation or service innovation and makes it scalable, replicable and self-reliant.

Societal (Social) related activities:
Short term internship at villages, slums or urban areas can be under social internship. The internship will be more fruitful, if students work in teams. The teams can select one or more fields to do their best in the field of agriculture, watershed management, wastelands development, non-conventional energy, low cost housing, sanitation, nutrition and personal hygiene, schemes for skill development, income generation, blood bank, government scheme such as Swachch Bharat, Accessible India, Digital India, Beti Bachao and Beti Padhao, Environment and Energy Conservation and Education, legal aid, consumer protection and allied field including Indian Red Cross Society, National Cadet Corps, Bharat Scouts and Guides.

Places for Innovation/Entrepreneurial Activities:
Students shall carryout Innovation or Entrepreneurial activities or both at the Incubation Center and

Entrepreneurship Cell of the parent institution or elsewhere such as ATAL Incubation Centers [A flagship of Atal Innovation Mission (AIM), NITI Aayog for promoting the culture of innovation and entrepreneurship in India], institutes of national importance, public sector units, IT companies, government organizations, and non-governmental organizations, industries including MSME, etc. Institutes, should deter students to opt for internships at places established for commercial benefits.

Course Outcomes: Students will be able to

1. Acquire academic/ career/ personal overall skill/ knowledge development.
2. Perceive ample opportunities for professional growth and achievement with relevance to society and environment.
3. Expose to real job world environment and gain practical knowledge with experience.
4. Build leadership qualities, teamwork, collaborations, cooperation, and facility in using virtual workspace.
5. Intensify creativity, artistry, curiosity, imagination, innovation, incubation, entrepreneurial skills and personal expression.
6. Write report on the work/ project carried out with presentation.

Rubrics for Internal Evaluation (Total Marks: 100)

Indicator	Poor	Average	Good	Excellent
Acquired skills or knowledge (10 Marks) (CO1)	Not gained any skill / knowledge **or** Attended a few sessions. **0-1 Marks**	Partial skill/Knowledge gained. Only Block Diagram/ Notes/Description **2-4 Marks**	Average skill/knowledge gained. Lack of Technical/ Knowledge. **5-7 Marks**	Complete skill/ knowledge gained. All Skills Acquired. **8-10 Marks**
Presentation (10 Marks) (CO5)	Absence for presentation **or** Presented after the due date. **0-1 marks**	Information is lacking/unclear & communicated in such a way that the audience can not understand the purpose of the evidence of work and internship experiences. **2-4 Marks**	Information is not presented in a clear manner and many details are missing related to the evidence work and internship experiences. **5-7 Marks**	Information is presented in such a way that the audience can understand the purpose of the evidence of work and internship experiences. **8-10 Marks**
Weekly report (10 Marks) (CO6)	Weekly report not submitted **or** Few days report was submitted. **0-1 Marks**	One Weekly report submitted. **2-4 Marks**	Two weekly reports submitted. **5-7 Marks**	All three weekly reports submitted **8-10 Marks**

Practical Knowledge (10 Marks) (CO3)	Not gained any practical knowledge **or** Able to define basic concepts. **0-1 Marks**	Partial practical Knowledge gained. Less hands-on experience. **2-4 Marks**	Average practical knowledge gained. Only few models are exhibited. **5-7 Marks**	Complete practical knowledge gained. **8-10 Marks**
Societal and environmental relevance (10 Marks) (CO2)	No relevance to society or environment (At-least one relevance) **0-1 Marks**	Partial relevance to society or environment. **2-4 Marks**	Average relevance to society or environment. **5-7 Marks**	Directly Relevant to society or environment. **8-10 Marks**
Viva (10 Marks) (CO4)	Does not know any information **or** Fair leadership quality/ teamwork/ cooperation. **0-1 Marks**	Provides irrelevant information for all questions. Good leadership quality/ teamwork/ cooperation. **2-4 Marks**	Provides incomplete information for all questions. Better leadership quality/ teamwork/ cooperation. **5-7 Marks**	Provides complete information for all questions. Outstanding leadership quality/ teamwork/ cooperation. **8-10 Marks**
Report (40 Marks) (CO6)	Does not submit the report. **0 Marks**	Report submitted does not fulfill the prescribed format/submission after one weeks of the deadline. **1-24 Marks**	Report submitted partially fulfills the prescribed format/ submission after one weeks of the deadline. **25-32 Marks**	Report submitted fulfills the prescribed format / submission in par with the deadline. **33-40 Marks**

CIE and SEE Details for Scheme 2021

Course	CIE (Minimum Passing Marks 40% of Max Marks)		SEE (Minimum Passing Marks 35% of Max Marks)	
	Max Marks	Min Passing marks	Max Marks	Min Passing marks
Innovation / Entrepreneurship/ Societal Internship	**100**	**40**	**-**	**-**

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER - V

Automotive Electronics (3:0:0) 3
(effective from the academic year 2021-22)

Course Code	21ET541	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	3

Course objectives:

This course will enable students to:

1. Understand Role of automotive Electronics
2. Learn different Automotive concepts to design control systems, Sensors and Communication protocols etc.
3. Demonstrate the role of different sensors and actuators working in auto motives.

Introduction: Automotive electronics, its role in the automotive industry and its impact on society and economic growth of country.

Module – 1

Automotive Fundamentals:
Evolution of Automotive Electronics, Automobile Physical Configuration, Survey of Major Automotive Systems.

The Basics of Electronic Engine Control :
Motivation for Electronic Engine Control, Exhaust Emissions, Fuel Economy, Concept of an Electronic Engine control system, Definition of General terms, Definition of Engine performance terms, Engine mapping, Effect of Air/Fuel ratio, spark timing and EGR on performance, Control Strategy, Electronic Fuel control system, Analysis of intake manifold pressure, Electronic Ignition.

(8 Hours)

Module – 2

Automotive Control System applications of Sensors and Actuators:
Typical Electronic Engine Control System, Variables to be measured, Automotive Sensors Airflow rate sensor, Strain Gauge MAP sensor, Engine Crankshaft Angular Position Sensor, Magnetic Reluctance Position Sensor, Hall effect Position Sensor, Shielded Field Sensor, Optical Crankshaft Position Sensor, Throttle Angle Sensor (TAS), Engine Coolant Temperature (ECT) Sensor, Exhaust Gas Oxygen (O2/EGO) Lambda Sensors, Piezoelectric Knock Sensor.

Automotive Actuators: Solenoid, Fuel Injector, EGR Actuator, Ignition System.

(8 Hours)

Module – 3

Digital Engine Control Systems – Digital Engine control features, Control modes for fuel Control (Seven Modes), EGR Control, Electronic Ignition Control - Closed loop Ignition timing, Spark Advance Correction Scheme, Integrated Engine Control System - Secondary Air Management, Evaporative Emissions Canister Purge, Automatic System Adjustment, System Diagnostics).

(8 Hours)

Module – 4

Automotive Networking :

Bus Systems, Classification, Applications in the vehicle, Coupling of networks, Examples of networked vehicles, Buses, CAN Bus, LIN Bus, MOST Bus, Bluetooth, FlexRay, Diagnostic Interfaces.

Vehicle Motion Control – Typical Cruise Control System, Digital Cruise Control System, Digital Speed Sensor, Throttle Actuator, Digital Cruise Control configuration, Cruise, Control Electronics (Digital only),Antilock Brake System (ABS)

(8 Hours)

Module – 5

Future Automotive Electronic Systems:

Alternative Fuel Engines, Electric and Hybrid vehicles, Fuel cell powered cars, Collision Avoidance Radar warning Systems, Low tire pressure warning system, Heads Up display, Speech Synthesis, Navigation – Navigation Sensors - Radio Navigation, Signpost navigation, dead reckoning navigation, Voice Recognition Cell Phone dialing, Advanced Cruise Control, Stability Augmentation, Automatic driving Control.

Summary of the Course :

This course basically deals with fundamentals of automotive electronics covering from Electronic engine Control unit to role of sensors and actuators in making user life comfortable and safer. The role of communication protocols is also discussed in details along with expected automotive electronic systems emphasizing features like collision avoidance radar warnings, navigation sensors to advanced cruise control systems.

(8 Hours)

Note: Students are required to evaluate the performance of performance of Sensors and actuators required to function precisely in Automotive environment by using Matlab

Course outcomes: The students will be able to:

CO1: Understand overview of automotive components, subsystems, and basics of Electronic Engine Control in today's automotive industry.

CO2: **Use** available automotive sensors and actuators while interfacing with microcontrollers microprocessors during automotive system design.

CO3: **Analyse** the role of different sensors, actuators and network protocols used in various modules in automotive systems

CO4: **Design** electronics that attribute the reliability, safety, and smartness to the automobiles, providing add-on comforts

CO5: **Evaluate** the performance of automotive systems using tools.

Question paper pattern:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
  a. There will be a maximum of three sub-questions from each module.
  b. There will be a choice from two full questions from each module.

Textbooks

1. William B. Ribbens**,** Understanding Automotive Electronics**,** 6th Edition., Elsevier Publishing

References

1. Bosch Gmbh (Ed.) **,** Bosch Automotive Electrics and Automotive Electronics Systems and components, Networking and Hybrid Drive**,** 5th Edition, John Wiley& Sons Inc, 2007

B.E IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

INFORMATION THEORY AND CODING (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21ET542	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 concept of Entropy, Rate of information and order of the source with reference to dependent and independent source.
2. Study various source encoding algorithms.
3. Model discrete & continuous communication channels.
4. Study various error control coding algorithm0s.

Introduction:

Information theory, Coding, Significance of information and coding in the current scenario, Industrial applications, research in the field of information theory, Impact of the information theory on societal problems and sustainable solutions.

Module – 1

Information Theory:

Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate of Markoff Sources.

(9 Hours)

Module – 2

Source Coding:

Source coding theorem, Prefix Codes, Kraft McMillan Inequality property – KMI. Encoding of the Source Output, Shannon's Encoding Algorithm. Shannon Fano Encoding Algorithm, Huffman codes, Arithmetic Coding.

(7 Hours)

Module – 3

Information Channels:

Communication Channels. Channel Models, Channel Matrix, Joint probability Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of : Binary Symmetric Channel, Binary Erasure Channel, Muroga,s Theorem.

(7 Hours)

Module – 4

Error Control Coding:

Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting hamming Codes, Table lookup Decoding using Standard Array.

Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection.

(8 Hours)

Module – 5

Some Important Cyclic Codes: Golay Codes, BCH Codes.

Convolution Codes: Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm (Text 2: 7.1 – 7.3, 7.6.3).

Summary of the syllabus: The student will be able to explore the concepts of information theory which help to detect and correct errors and also design different codes considering efficiency.

(9 Hours)

Course outcomes: The students will be able to:

CO1: Understand the measures of information, information sources, source encoding algorithms, communication channels and channel encoding techniques.

CO2: **Apply** the knowledge of information coding techniques/algorithms to solve problems related to entropy and information content of discrete sources.

CO3: **Analyse** different techniques/algorithms used for encoding and decoding of messages.

CO4: **Interpret** the given case study situation related to applications of information theory & coding.

CO5: Perform in a **group** to make effective **presentation** on the topics related to applications of error control coding.

Text Books:

1. Digital and analog communication systems**,** K. Sam Shanmugam**,** John Wiley India Pvt. Ltd**,** 1996.
2. Information Theory and Coding, Muralidhar Kulkarni, K.S. Shivaprakasha, Wiley India Pvt. Ltd, 1st Edition 2015.

References:

1. Digital Communication**,** Simon Haykin**,** John Wiley India Pvt. Ltd**,** Reprint 2009.
2. Digital Communications – Fundamentals and Applications, Bernard Sklar, Pearson Education, 2nd Edition, 2016, ISBN: 9780134724058.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Electronic Product Development (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21ET543	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 various stages of hardware, Software and PCB design.
2. Importance of product test and test specifications.
3. Special design considerations and importance of documentation

Module – 1

Power Supply Design: Introduction, Overview of Switching power Supply, DC to DC Converter, Buck Converter, Boost Converter and Buck- Boost Converter, Fly-back Converter, Forward Converter, Push-pull Converter, Half & Full bridge converter, Special converters, PWM control techniques, Study of PWM control ICs, Design of base drive.

(8 Hours)

Module – 2

Introduction to PCB Design using OrCAD tool: Introduction to PCBs and general guidelines, PCB design rules for various applications, Creation of new project in OrCAD tool, drawing the circuit in the schematic page using the components from the library, Simulation of Circuit using P-spice Simulation for verification of results, adding footprints to the components from the library.

(8 Hours)

Module – 3

PCB Fabrication Process: PCB Manufacturing Techniques, Film Master Generation methods, Plating and Etching Techniques, punching, drilling, milling, Study Soldering Techniques, Study of soldering defect and rectification, Based on theory- Practical and Assignment in Design, Manufacturing and Assembly.

(8 Hours)

Module – 4

Electromagnetic Interference: Overview of Electromagnetic Interference and Electromagnetic Compatibility, Occurrence of EMI, Considerations for EMC and EMI, Reduction techniques for EMI, Safety Ground, Grounding Schemes, Differences between Analog and Digital Ground.

(8 Hours)

Module – 5

Shielding Techniques, Line Impedance Stabilization, Network (LISN), Conducted Noise, Common Mode Noises (CM), Differential Mode Noises (DM), EMI filter Design.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Understand various stages of hardware, software and PCB design.
CO2: Apply the knowledge of electronics in PCB designing
CO3: Analyse the different product test and test specifications using simulation tools.
CO4: Design various PCB for different applications
CO5: Interpret the given case study material related to design and demonstrate an application of PCB

CO6: Perform in a group to design and execute an Electronic Product
Textbooks: 1. Electronic Instrument Design, Kim Fowler, Design Oxford university press. 2. Electronic Instrument Printed Circuit board design Techniques for EMC Compliance, Robert J. Herrick, Second edition, IEEE press. **References:** 1. The Electronics Handbook C Whitaker, CRC press

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Optical Networks (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21ET544	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. Acquire the knowledge about the optical fiber materials and structure.
2. Understand the fundamental properties of optical fibers and networks.
3. Know about the characteristics of optical fibers and designing the networks for certain applications.
4. Know about various configurations of optical networks.

Introduction: students will be familiar with optical fiber materials and their characteristics, optical fiber waveguides and their application in networks, fiber link design.

Module – 1

Optical fiber structures and wave guides:

Basic Optical laws and definitions, Optical fiber modes and configurations, step index fiber structure, Ray optic representation, Cutoff wavelength, V number and the number of modes, power flow in step index fiber, Single mode fibers, Mode field diameter, propagation modes in single mode fiber, graded index fiber structure. Fiber materials, Photonic crystal fibers, Fiber optic cables.

Signal degradation in optical fibers: Attenuation, absorption, scattering losses, bending losses, Core and cladding losses.

Signal dispersion in fibers: Dispersion, intra modal, intermodal, material, waveguide dispersion, polarization mode dispersion, international standards. Specialty fibers.

(9 Hours)

Module – 2

Optical sources and Detectors:

Energy bands, intrinsic and extrinsic material, direct and indirect band gaps, light emitting diodes(LEDs), LED structures, double hetero structure, surface emitter and edge emitter LEDs, Light source materials, quantum efficiency and LED power, modulation of an LED.

Laser diodes: modes and threshold conditions, fabry-Perot resonator cavity, laser diode rate equation, external quantum efficiency, resonant frequencies, laser diode structure and radiation patterns, single mode lasers, modulation of laser diode, Temperature effects.

Photo detectors: P-I-N and avalanche photo detectors, photo detector noise, signal to noise ratio, response time, and double hetero structure photo diodes, temperature effects on avalanche gain and performance measurements.

(8 Hours)

Module – 3

Optical receiver operation:

Digital system transmission, basic components of an optical receiver, error sources, front end amplifier, high impedance and transimpedance amplifier, digital receiver performance, receiver sensitivity, quantum limit, eye diagram, BER and Q-factor measurement, burst mode receivers, analog receivers.

(8 Hours)

Analog links:

Basic elements of an analog link, noise contributors, multichannel amplitude and frequency modulation, subcarrier multiplexing, RF-over fiber link, Radio over fiber link.

Digital links: point to point links, link power budget, Rise-Time budget.

Optical amplifiers: Semiconductor optical amplifiers, Erbium-doped fiber amplifiers, optical SNR, Power, in-line, post and pre amplifiers, multi channel operation. Raman amplifiers. Wideband optical amplifiers.

(7 Hours)

Module – 4

Power Launching and coupling:

Source-to –Fiber power launching, lensing scheme for power improvement, Fiber-to-Fiber , LED coupling to single mode Fibers, Fiber splicing, optical fiber connectors

WDM Concepts and components: definition, implementation of WDM network, WDM standards,

Passive optical couplers: 2X2 fiber coupler, 2X2 waveguide coupler, Star couplers, Machzehnder interferometer multiplexers, optical isolators and circulators.

Fiber grating filters: Fiber bragg grating and its applications, dielectric thin film filters,

(7 Hours)

Module – 5

Optical networks:

Network concepts (network terminology, network categories, Network layers, OSI model), Network topologies(bus, ring, star and mesh), SONET/SDH frame structures, rings, SDH networks, High speed Light wave links , Optical Add/Drop multiplexing.

Passive optical networks: Basic PON architecture, Active PON modules, GPON characteristics, WDM PON architectures, IP Over DWDM, optical Ethernet.

Performance Measurement and Monitoring:

Measurement standards, power measurement, optical time domain reflectometer (OTDR), optical performance monitoring.

Summary of the Course: students will be acquiring knowledge in interpreting different optical fiber materials and networks including design.

(9 Hours)

Course outcomes: The students will be able to:

CO1: Understand the fundamentals of Optical fibres, their modes and the optical networks

CO2: **Apply** the knowledge of optics to solve problems related to fibre optics and networks

CO3: **Analyse** the optical fibre cable and networks with respect to their characteristics

CO3: Perform in a **grou**p to carry out a **PPT presentation/quiz** related to fibre optics

and submit the report for the same

CO4: **Interpret** the case study question in fibre optics and networks applications.

Textbooks:

1. Gerd Keiser, Optical fiber communication, 5th Edition, McGraw Hill education (India) Private Limited
2. John M senior, Optical fiber communications, principles and practice, 3rd Edition, Pearson education

References:

1. Optical fiber communication Gerd Keiser, 5th Edition McGraw Hill education (India) private Limited**.**
2. Optical fiber communications, principles and practice John M senior, 3rd Edition Pearson education.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

OOPs Using C++ (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21ET545	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 basic concepts of object oriented programming language.
2. Learn Programming skills using OOPs.
3. Write the program for specific applications using OOPs concepts

Module – 1

Introduction: To OOPS concepts, Highlighting the importance of moving from procedure oriented programming to object oriented programming in reality. Probable applications of OOPs highlighting its impact on industry and revenue aspects of it.

Beginning with C++ and its features:

Getting started, the C++ program, Pre-processor Directives, The Built-In Array Data type, An object-oriented design, An exception based design, An array and pointers.

The Basic Language: Literal constant, Variables, Pointer type, String types, constant Qualifier, Reference types, the bool type, Enumeration type, Array Types.

(9 Hours)

Module – 2

Operators:

Arithmetic operators, Relational and Logical operators, Assignment operators, Increment and Decrement operators, The conditional operator, Bitwise operators. **Statements:** if, switch, for Loop, while, break, Go to, continue statements. **Functions:** Prototype, Argument passing, Recursion and Inline functions.

(7 Hours)

Module – 3

Exception Handling:

Meaning of Exceptions, Structure of exception handling, throwing an exception, catching an exception, Exception specification and Exceptions and Design issues.

(7 Hours)

Module – 4

Classes:

Definition, class objects, class Initialization, Class constructor, The class destructor, class object arrays.

Overload Operators: Unary, Binary, operators++ and --, Operators new and delete (Detailed discussion on programming with examples on these concepts).

(8 Hours)

Module – 5

Inheritances:

Different forms of Inheritances, private, Public, and protected inheritance, Class scope under Inheritance, Programming on Single, Multilevel, and multiple inheritances.

Summary of the Course:

The course on OOPs gives concepts of programming language starting from the different data types to special data types including user defined types and operators to functions. OOPs emphasizes on classes, objects and their initialization in programming. It also covers important concepts like operator overloading, polymorphism and different forms of Inheritance concepts with its applications.

(9 Hours)

Note: Students have to undergo MOOCS/NPTEL Course on OOPS/C++ concepts submit the certificate with score obtained in the exam.

Course Outcomes: The Students will be able to:

CO1: Understand different data types in C++ and Importance of OOPS Apply the knowledge and realize the logic using different logical techniques

CO2: **Apply** the basic knowledge of operators, Control statements and Functions to write C++ programs

CO3: **Analyse** the different Object oriented programming concepts in writing programs

CO4: **Design** and Develop Object oriented programs to generate the expected output/results

CO5: **Design** and Interpret object oriented programming paradigms to develop solutions to real world problems

Text Books

1. E.Balaguruswamy, Object Oriented Programming with C++, 4th Edition, TMH, 2013.
2. Venugopal, Object Oriented Programming with C++, 3rd Edition, 2013.

References

1. P.B Kotur, **"**Object oriented Programming with C++", Sapnabook house, 2013.
2. Lipmann, "OOPS with C++", Pearson, 2011.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Signal Processing (2:1:0) 3

(Effective from the academic year 2021-22)

Course Code	21EC55	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand different signals, mathematical operations and convolution.
2. Analyze Linear Time Invariant (LTI) systems in time and transform domains
3. Study the importance of mathematical tools such as Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) to analyse the signal.
4. Design and realization of FIR and IIR filters in different structural forms

Module – 1

Introduction to signals and systems: Introduction to signals and systems, significance and scope of signal processing in current scenario, industry applications, research and innovations related to digital signal processing, impact of the course on societal problems.

Definition of signal and systems, Classification of signals, Elementary signals, Basic operations on signals, System definition, classification and properties.

(9 Hours)

Module – 2

Time Domain representation of LTI system:

Impulse response, convolution sum, convolution integral. Computation of convolution sum and convolution integral using graphical method for unit step and unit step, unit step and exponential, exponential and exponential, unit step and rectangular.

(7 Hours)

Module – 3

Discrete Fourier transform:

Frequency domain sampling and reconstruction of discrete time signals. The Discrete Fourier transform, DFT as a linear transformation, properties of DFT: Linearity, Time shift, Time reversal, Frequency shift, Convolution and Parseval's (Remaining properties statements only).

Linear filtering methods based on the DFT:

Use of DFT in Linear Filtering, Filtering of Long Data Sequences.

(8 Hours)

Module – 4

Fast- Fourier Transform (FFT) Algorithms:

Efficient computation of the DFT, Radix-2 FFT algorithms for the computation of DFT and IDFT decimation in time and decimation in frequency algorithms

(7 Hours)

Module – 5

Design of IIR & FIR Filters:

Analog Butterworth Filters, Analog Filters using Lowpass prototype transformation. Bilinear Transformation and Frequency Warping, Digital Butterworth Filter Design using BLT. Design of Linear-phase FIR filters using windows - Rectangular, Hamming and hanning windows. (No derivations for BLT and FIR).

Realization of IIR & FIR Filters:

Direct form I and Direct form II realization of an IIR filter, Direct form I and Lattice realization of FIR filter.

Summary of the course: Course covers the basics of signals, system analysis in time domain, DFT on sequences, computational efficiency of FFT algorithms, design of IIR and FIR filters and realization.

Note: Students are required to execute toolboxes in MATLAB/ equivalent modern tool required for Digital signal processing, Apply these concepts to solve societal problems and submit the report as part of course. Some sample problems are given.

i To analyse and design a filter for any real time signal.
ii To compute basic signal processing operations in time and frequency domain on the pre-processed signal.
iii Case study examples

(9 Hours)

Course outcomes: The students will be able to:

CO1: **Apply** the fundamentals of mathematics to classify and perform various operations and transformations on signals and systems.

CO2: **Analyze** the continuous and discrete time systems in time and transfer domain.

CO3: **Design** different types of filters for communication and signal processing.

CO4: **Interpret** the given case study material related to design and demonstrate an application of digital signal processing.

CO5: Perform in a **group** to **design** and execute an application of any digital signal processing operations using modern tools.

Textbooks:

1. Simon Haykin and Barry Van Veen, **"** Signals and Systems", Wiley India, 2008
2. Proakis & Monalakis, "Digital signal processing Principles Algorithms & Applications", 4th Edition , Pearson education, New Delhi,2007.
3. Li Tan, Jean Jiang, "Digital Signal processing-Fundamentals and Applications", Academic Press 2013.

References:

1. Sanjit K Mitra, "Digital Signal Processing, A Computer Based Approach", 4th Edition,McGraw Hill Education, 2013.
2. Oppenheim & Schaffer,"Discrete Time Signal Processing", PHI,2003.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Advanced Electromagnetics (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21EC56	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. Familiarize with the distribution of electric charge and fields
2. Learn the concepts of magnetic field distribution and magnetic forces for different circuits.
3. Derive the Maxwell's equations required for Electromagnetic wave propagation
4. Know the concepts of transmission line theory at RF range.

Introduction: Significance and Scope of the course, Importance of the Course/Subject in Economic growth of Nation, Impact of the course on Societal Problems/ Sustainable Solutions/ National Economy, Career Perspective, Innovations (Current), Research status/trends.

Module – 1

Revision of Vector Calculus – Coordinate Systems, Differential Elements

Gauss' law, Divergence. Maxwell's First equation (Electrostatics), Vector Operator and divergence theorem. Ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and Flux density, Farday's law, displacement current

Self-study topics: Simulation of vector calculus operations using any software/ programming tools.

(9 Hours)

Module – 2

Maxwell's equations: Maxwell's equations in point form, Maxwell's equations in integral form.

Uniform Plane Wave: Wave propagation in free space and good conductors. Poynting's theorem and wave power, Skin Effect.

Self-study topics: Analyse of the given program which simulates the Maxwells equations and write the inference from the results

(8 Hours)

Module – 3

Transmission Line theory:

Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance. Smith chart, impedance matching using single stubs and double stubs.

(7 Hours)

Module – 4

Microwave Network theory:
Symmetrical Z and Y-Parameters, for reciprocal Networks, S matrix representation of multi-port Networks.

Microwave Passive Devices: Attenuators, Phase shifters, Waveguide Tees, Four port Circulator, Faraday rotation Isolator, Directional Coupler

(7 Hours)

Module – 5

Strip Lines: Introduction, Micro Strip lines, Characteristic impedance, Losses, Q factor in Microstrip lines, Parallel strip lines, Distributed parameters, Characteristic impedance and Attenuation losses in parallel strip lines, Coplanar strip lines, Shielded strip Lines

(9 Hours)

Summary of the course: The student will be able to explore the characteristics of the field distribution for the propagation of waves at RF and Microwave range.

Course outcomes: The students will be able to:

CO1: **Apply** the knowledge of mathematics to solve the problems related to Electromagnetics, Time varying fields and Transmission lines

CO2: **Analyse** different field configurations to derive Electromagnetic Field Equations and propagation of wave through medium

CO3: **Interpret** the given case study material related to the application of electromagnetics and transmission lines.

CO4: Perform in a **group** to make an effective presentation on electromagnetic radiation **hazards**, EM waves, effect of EM waves on environment and applications of electromagnetics and transmission lines.

Textbooks*:*

1. W.H. Hayt and J.A. Buck, "Engineering Electromagnetics", 7th Edition, Tata McGraw-Hill, 2009.
2. Samuel Liao, "Microwave Devices and circuits", 3rd Ed, Pearson Education, 2008.
3. Annapurna Das and Sisir K Das, "Microwave Engineering", TMH Publication, 2nd, 2010.

References:

1. John Krauss and Daniel A Fleisch, "Electromagnetics with applications", 5th Edition, McGraw-Hill ,2010.
2. David M Pozar, "Microwave Engineering", 4th Edition, John Wiley, 2011.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Embedded controller & VLSI (3:1:0) 4

(Effective from the academic year 2021-22)

Course Code	21ET57	CIE Marks	50
Teaching Hours/Week(L:T:P)	3:2:0	SEE Marks	50
Total Number of Lecture Hours	50	Exam Hours	03

Course objectives:

This course enables students to:

1. Program the 8051 using the various instructions for different applications.
2. Understand the architectural features and instruction set of 8 bit microcontroller and CMOS VLSI Design
3. Learn the concept of CMOS VLSI to build the schematic and layout.
4. Study the different types of CMOS logic structure.

Introduction: Microprocessors versus Microcontrollers, Significance and scope of microcontrollers in current scenario, industry applications, research and innovations related to microcontrollers, impact of course on societal problems.

Module – 1

Embedded Microcontrollers:

8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing, 8051 Stack, Stack and Subroutine instructions.

(10 Hours)

Module – 2

8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions.

8051 Instruction Set: Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (without loops) to use these instructions.

(10 Hours)

Module – 3

MOS Transistor Theory:

Introduction, Fabrication process- nmos, pmos, CMOS, MOS Device Design Equations, The Complementary CMOS Inverter – DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, Tristate Inverter.

(10 Hours)

Module – 4

Circuit Design Processes:

MOS layers. Stick diagrams. Design rules and layout – lambda-based design and other rules. Examples. Layout diagrams. Symbolic diagrams. Basic Physical Design of Simple logic gates.

(10 Hours)

Module – 5

CMOS Logic Structures:
CMOS Complementary Logic, Bi CMOS Logic, Pseudo-nMOS Logic, Dynamic CMOS Logic, Clocked CMOS Logic, Pass Transistor Logic, CMOS Domino Logic Cascaded Voltage Switch Logic (CVSL).

Summary of the Course : The student will be able to understand the Architecture and Instruction set of microcontroller and CMOS VLSI design approaches for various logic structure.

(10 Hours)

Course outcomes: The students will be able to:

CO1: Describe the architectural features and instructions of 8 bit microcontroller and basic MOS transistor.

CO2: **Apply** the knowledge gained for Programming 8051 for different applications and obtain the schematic and layout for logic circuits.

CO3: **Analyse** the different CMOS logic structures.

CO4: **Interpret** the given case study material related to Application of microcontroller and CMOS design.

CO5: **Demonstrate** the applications of embedded systems using 8051 through interfacing programs or simulate the different combinational/ sequential structures of CMOS logic.

Textbooks*:*

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi, "8051 Micro controller and Embedded System", 2nd Edition, Pearson Education Publication, 2006.
2. N.H. Weste and David Harris**,** "CMOS VLSI Design – A Circuits and Systems Perspective" **,** 3rd Edition , Wesley, 2005
3. Douglas A. Pucknell & Kamran Eshraghian , Basic VLSI Design , 3rd Edition, PHI, 2005

References:

4. Kenneth Ayala, "The 8051 Microcontroller, Architecture, Programming and Apllications", West Publishing Company, 3rd Edition, 2010.
5. R. Jacob Baker, "CMOS Circuit Design, Layout and Simulation", John Wiley India Pvt. Ltd, 2008 **.**

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Signal Processing Laboratory (0:0:1) 1

(Effective from the academic year 2021-22)

Course Code	21ECL58A	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	03

Course objectives:

This course will enable students to:

1. Simulate discrete time signals and verify sampling theorem.
2. Compute convolution, correlation and verify its properties.
3. Find solution of difference equation and determine the response to impulse, step and sinusoidal inputs.
4. Compute DFT using inbuilt functions and analyse the properties.
5. Compute and display the filtering operations and compare with the theoretical values.
6. Familiarity with DSP kits and implement basic operations of signals & systems

Part-A: Simulation Experiments

Following Experiments to be done using MA TLAB Following Experiments to be done using MA TLAB:

1. Verification of sampling theorem in time domain and frequency domain.
2. Linear and Circular convolution of two given sequences, Commutative, distributive and associative property of convolution.
3. Solving a given difference equation
4. Auto and cross correlation of two sequences and verification of their properties
5. Computation of N point DFT of a given sequence and to plot the magnitude and phase spectrum (using DFT equation and verify it by built-in routine).
   (i) Verification of DFT properties (like Linearity and Parseval's theorem, etc.)
   (ii) DFT computation of square pulse and Sinc function etc.
6. Design and implementation of Low pass and High pass FIR filter to meet the desired specifications (using different window techniques).
7. Design and implementation of a digital IIR filter (Low pass and High pass) to meet given specifications.

PART-B Experiments on DSK

1. Obtain the Linear convolution of two sequences.
2. Compute Circular convolution of two sequences.
3. Compute the N-point DFT of a given sequence.
4. Determine the Impulse response of first /second order system

Open ended experiment

Students have to carry out mini project on signal processing of Image / 1-D signals, present and prepare the report for the same.

Course outcomes: The students will be able to:

CO1: **Write** a code to carry out various basic operations on discrete signals and verify them using MATLAB / OCTAVE software.

CO2: **Simulat**e the programs and execute them on the DSP Starter Kit using Code Composer Studio Software tool.

CO3: **Write** the report for the conducted experiment.

CO4: **Conduct** open ended experiment to analyse 1-D /2-D signals.

Textbooks*:*

1. Vinay K Ingle, John G Proakis, "Digital Signal Processing using MATLAB", 4th Edition, Cengage India Private Limited,2017.

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Embedded Controller & VLSI Laboratory (0:0:1) 1

(Effective from the academic year 2021-22)

Course Code	21ETL58B	CIE Marks	50
Teaching Hours/Week(L:T:P)	0:0:2	SEE Marks	50
Total Number of Lecture Hours	26	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand the instruction set of 8051, an 8 bit microcontroller and the software tool required for programming in Assembly and C language.
2. Interface external devices and I/O with 8051 microcontroller.
3. Expertise working with CADNCE tool and library functions for CMOS structures

Part-A

Programs:

1. Write a program for Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Write a program to perform Arithmetic Instructions - Addition/subtraction, multiplication.
3. Write a program to verify the functionality of UP/DOWN Counters.
4. Write a program to verify Boolean & Logical Instructions (Bit manipulations).
5. Write a program to perform Code conversion: BCD – ASCII; ASCII – Decimal; Decimal – ASCII.
6. Draw the schematic and Layout of a CMOS Inverter using library files.
7. Draw the schematic and Layout of a CMOS 2 input NAND gate using library files.
8. Draw the schematic and layout of common source amplifier with PMOS current mirror load.
9. Design an 4Bit UP/DOWN Counter Asynchronous Reset Counter
   a. Write Verilog Code
   b. Verify the Functionality using Test-bench
   c. Synthesize the Gate Level Netlist by setting Area and Timing Constraints and also find the Critical Path and Maximum Frequency of Operation
10. Perform the above for 32Bit UP/DOWN Counter
11. Design a Latch and Flip-Flop to compare the synthesis report of D, SR, JK.

Note: Experiments 6-11 have to be executed using Cadence tool.

PART-B Experiments on DSK

Interfacing:

1. Interface and Control a DC Motor.
2. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
3. Interface a DAC and generate Triangular and Square waveforms.

Open end experiment

Course Outcomes: The students will be able to:

CO1**:** Conduct the experiments related to microcontroller and VLSI using Keil µVision IDE and Cadence respectively.

CO2: **Write the report** for the conducted experiment.

CO3: **Conduct** open end experiment to analyse any small embedded systems.