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 Communication Engineering

V and VI Semester Scheme and Syllabus
2021 Scheme - Autonomous

Approved in the BoS meeting held on 22.05.2023

Vision and Mission of the Department

Vision

Be a pioneer in providing quality education in electronics, communication, and allied engineering fields to serve as a valuable resource for industry and society

Mission

1. Impart sound theoretical concepts and practical skills through innovative pedagogy

2. Promote Interdisciplinary Research

3. Inculcate Professional Ethics

Program Educational Objectives (PEOs)

1. Work as Professionals in the area of Electronics, Communication and Allied Engineering Fields.
2. Pursue Higher Studies and involve in Interdisciplinary Research Work.
3. Exhibit Ethics, Professional Skills and Leadership Qualities in their Profession.

Program Specific Outcomes (PSOs)

1. Demonstrate the knowledge of electronic devices, circuits, micro-nano electronics and other fundamental courses to exhibit competency in the domain of VLSI design.
2. Comprehend the gathered knowledge and technological advancements in the field of communication and signal processing.
3. Exhibit the skills gathered to analyze, design, develop software applications and hardware products in the field of embedded systems and allied areas.

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

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 AND COMMUNICATION ENGINEERING (ECE) | **Semester: V**

Sl. No	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS51	Management and Entrepreneurship	ECE	3	0	0	0	3	3	50	50	100
2	AEC	21AEC52	Cyber and Intellectual Property Law	ECE	0	2	0	0	1	2	50	50	100
3	INT	21INT53	Innovation/Entrepreneurship/ Societal Internship	ECE	0	0	0	6	3	-	100	-	100
4	PE	21EC54X	Professional Elective - I	ECE	3	0	0	0	3	3	50	50	100
5	PC	21EC55	Signal Processing	ECE	2	2	0	0	3	3	50	50	100
6	PC	21EC56	Advanced Electromagnetics	ECE	3	0	0	0	3	3	50	50	100
7	PC	21EC57	Embedded Controller	ECE	4	0	0	0	4	3	50	50	100
8	PC	21ECL58A	Signal Processing Laboratory	ECE	0	0	2	0	1	3	50	50	100
9	PC	21ECL58B	Embedded Controller Laboratory	ECE	0	0	2	0	1	3	50	50	100
TOTAL					**15**	**4**	**4**	**6**	**22**		**500**	**400**	**900**

Professional Elective - Group I	
Course Code	**Course Title**
21EC541	Digital Image Processing with MATLAB
21EC542	Information Theory and Coding
21EC543	Power Electronics and Instrumentation
21EC544	Python Application Programming
21EC545	Mathematics for Machine Learning -I

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Syllabus

B.E. ELECTRONICS AND COMMUNICATION 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	03

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 and sources 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, Behavioural 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 for the 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-Hill Education, 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 Business Enterprises", 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 COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

Semester – V

Cyber and Intellectual Property Law (0:2:0)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	2

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. (03 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 (03 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. (03 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 cybercrime, Important cybercrimes.

C**yber policies:** Need for an information security policy, information security standard-ISO, introduction to various security policies. Case study on cybercrime. (03 Hours)

Module – 5

Phishing; Sp ear 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. (03 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.

BE ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Innovation / Entrepreneurship/ Societal Internship (0:0:0:6) 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

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.

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.

CO-PO Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2						2			
CO2						2					2	
CO3			2	2			3	2				
CO4									3	3	2	2
CO5					2				3			2
CO6									2	3		
Average	3	2	2	2	2	2	3	2	3	3	2	2

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 COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Digital Image Processing with MATLAB (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	**21EC541**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Understand the fundamentals of digital image processing.
2. Understand the image transforms used in digital image processing.
3. Understand the image enhancement techniques used in digital image processing.
4. Understand the image restoration techniques and methods used in digital image processing.
5. Understand the Morphological Operations used in digital image processing.
6. Understand the IP toolbox in the MATLAB software and write MATLAB programs to perform various operations on images.

Module – 1

Introduction:

Digital Image Fundamentals: What is Digital Image Processing? Some applications, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception.

Image sampling and Quantization, Types of digital images, Some Basic Relationships Between Pixels,

(8 Hours)

Module – 2

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

Basic use of MATLAB:

Introduction, Basic use of MATLAB, Variables and the workspace, Dealing with matrices, Help in MATLAB

(8 Hours)

Module – 3

Image Enhancement in Frequency Domain:

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

Images and MATLAB:

Image file formats, Data types and conversions, Basic commands in MATLAB, Point processing.

(8 Hours)

Module – 4

Restoration:

Noise models, Restoration in the Presence of Noise Only using Spatial Filtering.

Morphological Image Processing:

Preliminaries, Erosion and Dilation, Opening and Closing

Filtering in MATLAB:

Low and High pass filters, Gaussian filters, Cleaning salt and pepper noise, Cleaning Gaussian noise (8 Hours)

Module – 5

Segmentation:
Point, Line and Edge detection, Thresholding, Region based segmntation.
Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing.
MATLAB Programming:
Introduction, Dilation and erosion, Edge detection, Color images in MATLAB, Pseudocoloring, Processing of color images.

(8 Hours)

Recap/ Summary of all modules

Course outcomes:

The students will be able to:

CO1: Comprehend how image information can be modeled analytically and use transform-domain representation of images.

CO2: Apply image processing techniques in both the spatial and frequency domains

CO3: Analyze images to extract features of interest and techniques to restore images based on the knowledge of acquisition system

CO4: Perform digital image processing using software tool MATLAB

Textbooks

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

References

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

COs and POs Mapping

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	2											
CO2	**3**											
CO3		**3**										
CO4					**3**				**2**	**2**		**2**

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

B.E ELECTRONICS AND COMMUNICATION 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	**21EC542**	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 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 algorithms.

Module – 1

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.

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

Text Books/References:

Title & Edition	Author	Publisher	Year of Publication	Text / Reference
Digital and analog communication systems	K. Sam Shanmugam	John Wiley India Pvt. Ltd	1996	Text
Information Theory and Coding, 1st Edition	Muralidhar Kulkarni, K.S. Shivaprakasha	Wiley India Pvt. Ltd	2015	Text
Digital Communication	Simon Haykin	John Wiley India Pvt. Ltd	Reprint 2009	Reference
Digital Communications – Fundamentals and Applications	Bernard Sklar	Pearson Education	2016	Reference

COs and POs Mapping

COs	PO's											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	1											
CO2	3											
CO3		3										
CO4			3									
CO5									3	3		

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

SEMESTER – V

Power Electronics and Instrumentation (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	**21EC543**	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. Study and analysis of thyristor circuits with different triggering conditions.
2. Learn the applications of power devices in controlled rectifiers, converters and inverters.
3. Understand types of instrument errors.
4. Develop circuits for multirange Ammeters and Voltmeters.
5. Describe principle of operation of digital measuring instruments and Bridges.
6. Understand the operation of Transducers, Instrumentation amplifiers and PLCs.

Module – 1

Principles of Measurement: Static Characteristics, Error in Measurement, Types of Static Error. Multirange Ammeters, Multirange voltmeter.

Digital Voltmeter: Ramp Technique, Dual slope integrating Type DVM, Direct Compensation type and Successive Approximations type DVM Digital Multimeter: Digital Frequency Meter and Digital Measurement of Time, Function Generator.

(8 Hours)

Module – 2

Bridges: Measurement of resistance: Wheatstone's Bridge, AC Bridges-Capacitance and Inductance Comparison bridge, Wien's bridge.

Transducers: Introduction, Electrical Transducer, Resistive Transducer, Resistive position Transducer, Resistance Wire Strain Gauges, Resistance Thermometer, Thermistor, LVDT. Instrumentation Amplifier using Transducer Bridge, Temperature indicators using Thermometer, Analog Weight Scale

(8 Hours)

Module – 3

Programmable Logic Controller: Structure, Operation, Relays and Registers

Introduction: History, Power Electronic Systems, Power Electronic Converters and Applications Thyristors: Static Anode-Cathode characteristics and Gate characteristics of SCR, Turn ON methods, Turn-Off mechanisms, Gate Trigger Circuit: Resistance Firing Circuit, Resistance capacitance firing circuit, Unijunction Transistor: Basic operation and UJT Firing Circuit

(8 Hours)

Module – 4

Turn-Off Methods: Natural and Forced Commutation – Class A and Class B types

Phase Controlled Converter: Control techniques, Single phase half wave and full wave-controlled rectifier with resistive and inductive loads, effect of freewheeling diode..

(8Hours)

Module – 5

Choppers: Chopper Classification, Basic Chopper operation: step-down, step-up and step-up/down choppers

Inverters: Classification, Single phase Half bridge and full bridge inverters with R and RL load **Switched Mode Power Supplies**: Isolated Flyback Converter, Isolated Forward Converter

(8 Hours)

Course Outcomes: The students will be able to:

CO1: Apply the concepts of mathematics and electronic principles in the design electronic devices

CO2: Analyze the working principle of electronic devices for its extension and application

CO3: Design the electronic devices based upon the application like conversion and controlling

CO4: Present the technical aspects of electronic devices and its application in real world scenario in a team

Text Books/References:

Title & Edition	Author	Publisher	Year of Publication	Text / Reference
1.Power Electronics, 2nd Edition	1. M.D Singh and K B Khanchandani,	Tata Mc-Graw Hill	2009, , ISBN: 0070583897	**Text**
2.Electronic Instrumentation, 3 rd Edition	H. S. Kalsi	McGraw Hill	2012, ISBN: 9780070702066	**Text**
3.Power Electronics, Circuits, Devices and Applications, 3rd/4th Edition	Mohammad H Rashid	Pearson Education Inc,	2014 ISBN: 978-93-325-1844-5	**Reference**
4.Power Electronics, Essentials and Applications, 3rd edition	L.Umananda	John Wiley India Pvt. Ltd	2009	**Reference**
5.Electronic Instrumentation & Measurements, 2nd Edition	David A. Bell	Oxford University Press PHI	2006, ISBN 81-203-2360	**Reference**
6.Modern Electronic Instrumentation and Measuring Techniques,1st Edition	A. D. Helfrick and W.D. Cooper	Pearson	2015, ISBN: 9789332556065.	**Reference**

COs and POs Mapping

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3											
CO2		2										
CO3			3									
CO4								2	3	3		2

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Python Application Programming (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	**21EC544**	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 the basic syntax of executing python coding and demonstrate the proficiency in handling python code.
2. Apply the concept learnt on basic syntax as well as core data structures to efficiently write the coding
3. Create, Run and execute python applications using Python interpreter

Module – 1

Introduction: Introduction to python programming, significance and scope of python programming in current scenario, industry applications, impact on course on societal problems**.**

Why should you learn to write programs, Variables, Operators and operands, expressions and statements, Conditional execution, Iteration. (8 Hours)

Module – 2

Strings, Files Lists, Dictionaries, Tuples, Sets. Functions

(8 Hours)

Module – 3

Regular Expressions, , Lambda functions, Try and catch exceptions, Assert statement.
(8 Hours)

Module – 4

Classes and objects, Classes and functions, Classes, and methods, Enums,
Decorators,

(8 Hours)

Module – 5

Networked programs, Using Web Services **,** Python libraries suitable for Machine learning:

Numerical analysis and data exploration with NunPy Arrays, data visualization with Matplotlib, Markers.

(8 Hours)

Summary of the course: Course covers the importance and benefits of python programming.

Note: Students should implement basic programs using python and submit the report from the same as a part of the course

Course Outcomes: The students will be able to:

CO1: Understand the various programming concepts of python language.

CO2: Apply the various approaches to write code for a given a problem statement

CO3: Analyze Python Programs using core data structures like functions, strings, Lists, Dictionaries.

C04: Perform in a group to Write and execute codes for real-time applications using modern tools.

C05: Interpret the given case study material related to concepts and approaches used for python programming.

Text Books/References:

Title & Edition	Author	Publisher	Year of Publication	Text / Reference
Python for Everybody: Exploring Data Using Python 3. 1st Edition.	Charles R Severance	Create Space Independent Publishing Platform	2016	Text
Think Python: How to Think Like a Computer Scientists. 2nd Edition.	Allen B. Downey	Green Tea press	2015	Text
Programming Python. 4th Edition.	Marks Lutz	O'Reilly MEDIA	2011	Reference
Core Python Applications programming. 3rd Edition.	Wesley J Chun	Pearson Education India	2015	Reference
Python programming using problem solving approach.	Reema Thareja	Oxford University press	2017	Reference

COs and POs Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	1											
CO2	3											
CO3	3	2	3									
CO4	3	3	1		3				3	3		
CO5	3	2	1									

Level3- Highly Mapped, Level 2-ModeratelyMapped, Level1-LowMapped, Level0-NotMapped

Choice Based Credit System (CBCS)

SEMESTER – V

Mathematics for Machine Learning – I (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	**21EC545**	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. Represent numerical data as vectors and matrices.
2. Obtain the similarity and distances of two vectors/matrices through the concepts of analytical geometry.
3. Explore the fundamentals of matrix decompositions and allow for an intuitive interpretation of the data.
4. Understand some of the important mathematics underlying in the optimization problems.

Module – 1

Linear Algebra: Systems of Linear Equations, Matrices, Solving Systems of Linear Equations, Vector Spaces, Linear Independence, Basis and Rank, Linear Mappings, Affine Spaces.

Module – 2

Analytic Geometry: Norms, Inner Products, Lengths and Distances, Angles and Orthogonality, Orthonormal Basis, Orthogonal Complement, Inner Product of Functions, Orthogonal Projections, Rotations.

Module – 3

Eigen values and Eigen vectors: Eigen values and Eigen Vectors, Diagonalization of a Matrix, Special Matrices (Positive Definite, Symmetric) and their properties, Singular Value Decomposition.

Module – 4

Vector Calculus-1: Differentiation of Univariate Functions, Taylor Series, Differentiation Rules, Partial Differentiation and Gradients, Basic Rules of Partial Differentiation, Chain Rule, Gradients of Vector-Valued Functions

Module – 5

Vector Calculus-2: Gradients of Matrices, Useful Identities for Computing Gradients, Backpropagation and Automatic Differentiation, Gradients in a Deep Network, Automatic Differentiation, Higher-Order Derivatives.

Course Outcomes: The students will be able to:

CO1:	Understand the fundamentals of linear algebra, analytical geometry and matrix decomposition and vector calculus
CO2:	Apply the knowledge of linear algebra, analytical geometry and matrix decomposition in solving the machine learning problems.
CO3:	Analyse different techniques used in vector calculus with its application in machine learning
CO4:	Interpret the given case study situation related to applications of mathematics in machine learning

Text Books/References:

Title & Edition	Author	Publisher	Year of Publication	Text / Reference
Mathematics for Machine Learning	Marc Peter Deisenroth , A. Aldo Faisal , Cheng Soon Ong	Cambridge University Press	**2020**	Text
Linear Algebra and Optimization for Machine Learning	Charu C. Aggarwal	Springer	2020	Reference
Linear Algebra and its Applications,	Gilbert Strang	Cengage	2005	Reference

Fourth Edition				
Linear Algebra, Fourth Edition	Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence	PHI	2003	Reference

COs and POs Mapping

CO	PO														
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2												3	
CO2	2	3		2										3	
CO3	3	3		2										3	
CO4	3	2		2						2		3		3	

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Choice Based Credit System (CBCS)

SEMESTER – V

Signal Processing (2:2:0) 3

Common to ECE and ETE

(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:

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.

Text Books/References:

Title & Edition	Author	Publisher	Year of Publication	Text / Reference
Signals and Systems	Simon Haykin and Barry Van Veen	Wiley India	2008	Text
Digital signal processing Principles Algorithms & Applications, 4th Edition	Proakis & Monalakis	Pearson education, New Delhi	2007	Text
Digital Signal processing- Fundamentals and Applications	Li Tan, Jean Jiang	Academic Press	2013	Text
Digital Signal Processing, A Computer Based Approach, 4th Edition	Sanjit K Mitra	McGraw Hill Education	2013	Reference

Discrete Time Signal Processing, 2nd Edition	Oppenheim & Schaffer	PHI	2003	Reference

COs and POs Mapping

COs	Pos											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3											
CO2		3										
CO3			3									
CO4				3					3	3		2
CO5					3	2			3	3		2

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Advanced Electromagnetics (3:0:0) 3

Common to ECE and ETE

(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.

Module – 1

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.

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.

Cos and POs Mapping

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3											
CO2		3										
CO3			3									
CO4				2	3				3	3		3

Level3- Highly Mapped, Level 2-Moderately Mapped, Level1-Low Mapped, Level0-Not Mapped

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Embedded Controller (4:0:0) 4

(Effective from the academic year 2021-22)

Course Code	**21EC57**	CIE Marks	50
Teaching Hours/Week(L:T:P)	4:0:0	SEE Marks	50
Total Number of Lecture Hours	50	Exam Hours	03

Course objectives:

This course enables students to:

1. Understand the architectural features and instruction set of 8051 and ARM cortexM3, hardware components of an embedded system.
2. Program ARM Cortex M3 using the various instructions and C language for different applications.
3. Learn hardware components and their selection method based on the characteristics and attributes of an embedded system.
4. Develop the hardware software design approaches for embedded system applications.

Module – 1

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.

Embedded Systems, 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.

(11 Hours)

Module – 2

8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple

Assembly language program examples (without loops) to use these instructions.

(9 Hours)

Module – 3

ARM-32 bit Microcontroller:

Introduction, Architecture of ARM Cortex M3, Various Units in the architecture, Thumb-2 technology and applications of ARM. Debugging support, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence.

(9 Hours)

Module – 4

ARM Cortex M3 Instruction Sets and Programming:

Assembly basics, Instruction list and description, Thumb and ARM instructions, Special instructions, Useful instructions, CMSIS, Assembly and C language Programming.

(9 Hours)

Module – 5

ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. Sensors, Actuators**,** Communication Interfaces (I2C, SPI, IrDA, Bluetooth, Wi-Fi, Zigbee only)

Embedded Systems:

Application and Domain specific, Hardware Software Co-Design and Program Modelling Interfacing Programs to display Led, generate buzzer sound and Relay, Stepper motor, DC Motor, PWM.

Summary of the Course : The student will be able to understand the Architecture and Instruction set of ARM microcontroller and design and develop a small embedded system

(12 Hours)

Course outcomes: The students will be able to:

CO1: Describe the architectural features and instruction set of 8051 and ARM Cortex M3 micocontroller.

CO2: Apply the knowledge gained for Programming of 8051 and ARM Cortex M3 for different applications.

CO3: Analyze the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.

CO4: Discuss the hardware /software co-design approaches.

CO5: Demonstrate the applications of embedded systems using ARM through interfacing programs.

Textbooks*:*

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi, "8051 Micro controller and Embedded System", 2nd Edition, Pearson Education Publication, 2006.
2. Joseph Yiu, "The Definitive Guide to the ARM Cortex-3",2nd Edition,Newnes,(Elsevier),2010 .
3. Shibu K V, "Introduction to Embedded Systems", 2nd Edition, Tata McGraw Hill Education Private Limited.

References:

1. James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008.
2. Raghunandan..G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication,2019
3. "Embedded Systems with Arm Cortex-M Microcontrollers in Assembly Language and C", 2nd Edition, 2nd E -Man Press LLC ©2015.
4. The Insider‟s Guide to the ARM7 Based Microcontrollers, Hitex Ltd.,1st edition, 2005.
5. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015. 4. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.

Cos and POs Mapping

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3										
CO2			3									
CO3				3								
CO4					3	3						3
CO5								3	3	3	3	

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Signal Processing Laboratory (0:0:2)1

Common to ECE and ETE

(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:

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).
6. (i) Verification of DFT properties (like Linearity and Parseval's theorem, etc.)

(ii) DFT computation of square pulse and Sinc function etc.

7. Design and implementation of Low pass and High pass FIR filter to meet the desired specifications (using different window techniques).

8. 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

Module – 3

Students should do 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: Simulate 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.

Conduct of Practical Examination:

The SEE will be conducted for 100 marks and reduced to 50 Marks

- Write up carries 15% of the maximum marks
- Conduction of the experiment with tabulation and graphs carries 70% of the maximum marks
- Viva-voce carries 15% of the maximum marks

Text Books/References:

Title & Edition	Author	Publisher	Year of Publication	Text / Reference
Digital Signal Processing using MATLAB, Fourth Edition	Vinay K Ingle, John G Proakis	Cengage India Private Limited,2017.	Cengage India Private Limited	2017.

COs and POs Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1					3							
CO2					3							
CO3										3		3
CO4					3					3		3

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Embedded Controller Laboratory (0:0:2) 1

(Effective from the academic year 2021-22)

Course Code	**21ECL58B**	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 and ARM Cortex M3, a 32 bit microcontroller and the software tool required for programming in Assembly and C language.
2. Program ARM Cortex M3 using the various instructions in assembly level language for different applications.
3. Interface external devices and I/O with ARM Cortex M3.
4. Expertise working with Keil compiler and develop C language programs and library functions for embedded system applications.

Part-A

Programs:

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication, and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal – ASCII.

PART-B Experiments on DSK

Interfacing: Conduct the following experiments on an ARM CORTEX M3 evaluation board using evaluation version of Embedded 'C' & Keil uVision-4 tool/compiler.

1. Display “Hello World” message using Internal UART.
2. Interface and Control a DC Motor.
3. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
4. Interface a DAC and generate Triangular and Square waveforms.
5. Interface a 4x4 keyboard and display the key code on an LCD.
6. Using the Internal PWM module of ARM controller generate PWM and vary its duty cycle.
7. Demonstrate the use of an external interrupt to toggle an LED On/Off.
8. Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.
9. Interface a simple Switch and display its status through Relay, Buzzer and LED.
10. Measure Ambient temperature using a sensor and SPI ADC IC.

Open end experiment

Course Outcomes: The students will be able to:

CO1: Acquaint with the assembly level and embedded C programming using 8051

CO2: Write, debug and Execute programs using Keil µVision IDE.

CO3: Write the report for the conducted experiment.

CO4: Conduct open end experiment to analyse any small embedded systems.

COs and POs Mapping

COs	**POs**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	3	3									
CO2	2	2	2	3								
CO3					3	3						
CO4							3	3	3	2	2	3