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 Electrical & Electronics Engineering

V and VI Semester Scheme and Syllabus
2021 Scheme - Autonomous

Approved in the BoS meeting held on 27.05.2023

Vision and Mission of the Department

Vision of the Department:
To emerge as one of the finest Electrical & Electronics Engineering Departments facilitating the development of competent professionals, contributing to the betterment of society.

Mission of the Department:
Create a motivating environment for learning Electrical Sciences through teaching, research, effective use of state of the art facilities and outreach activities.

Program Educational Objectives (PEOs)

Graduates of the program will,

PEO1	Have successful professional careers in Electrical Sciences, and Information Technology enabled areas and be able to pursue higher education.
PEO2	Demonstrate ability to work in multidisciplinary teams and engage in lifelong learning.
PEO3	Exhibit concern for environment and sustainable development.

After the successful completion of the course, the graduate will be able to,

PO1: Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

The Graduates of the Program will be able to

PSO1:	**Analyze and design electrical power systems.**
PSO2:	**Analyze and design electrical machines.**
PSO3:	**Analyze and design power electronic controllers for industrial drives.**
PSO4:	**Analyze and design analog and digital electronic 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: Department of Electrical and Electronics Engineering (EEE) — **Semester: V**

Sl. No	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS51	Management and Entrepreneurship	EE	3	0	0	0	3	3	50	50	100
2	AEC	21AEC52	Cyber and Intellectual Property law	EE	0	2	0	0	1	1	50	50	100
3	INT	21INT53	Innovation/Entrepreneurship/ Societal Internship	EE	0	0	0	6	3	-	100	-	100
4	PE	21EE54X	Professional Elective I	EE	3	0	0	0	3	3	50	50	100
5	PC	21EE55	Generation Transmission and Distribution	EE	3	0	0	0	3	3	50	50	100
6	PC	21EE56	Microcontrollers	EE	3	0	0	0	3	3	50	50	100
7	PC	21EE57	OPAMP and Linear ICs	EE	3	0	0	0	3	3	50	50	100
8	PC	21EEL58A	Microcontrollers Laboratory	EE	0	0	3	0	1	3	50	50	100
9	PC	21EEL58B	OPAMP and Linear ICs Laboratory	EE	0	0	3	0	1	3	50	50	100
10	PC	21EEL58C	Embedded System Design Lab	EE	0	0	3	0	1	3	50	50	100
TOTAL					15	2	9	6	22		550	450	1000

Professional Elective - Group I	
Course Code	**Course Title**
21EE541	Electric Vehicles
21EE542	Electromagnetic Field Theory
21EE543	Advanced Power Electronics
21EE544	Electrical and Electronics Measurements
21EE545	Sensors and Transducers

Syllabus of V Semester

B.E. ELECTRICAL AND ELECTRONICS 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 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, 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 entreprenuerial 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.

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 questions 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. 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. ELECTRICAL AND ELECTRONICS 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	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. (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 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. (03 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. (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.

ASSESSMENT METHODS

CIE Components (50 Marks)

Three Unit Tests each of 40 Marks (duration 01 hour)
Two Assignment : 20 Marks
Two AATs : 20 Marks
Sum of the Assignment and AATs will be out of 40 Marks and scaled down to 20 Marks
Sum of the three Internal Assessments Tests Marks will be out of 120 Marks and scaled down to 30 Marks i.e. Internal Assessments Tests : 30 Marks
Assignment and AAT : 20 Marks
Total CIE Marks : 50 Marks

Semester-End Examination (50 Marks)

- SEE question paper will be set for 50 questions of each of 01 marks
- The pattern of the question paper is MCQ.

Assessment Details (both CIE and SEE):

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

	• The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). • A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and 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.

B.E. ELECTRICAL AND ELECTRONICS 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

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. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

ELECTRIC VEHICLES (3:0:0)

(Professional Elective – Group I)

(Effective from the academic year 2021 -2022)

Course Code	21EE541	CIE Marks	50
Teaching Hours/Week (L: T:P)	3	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	3

Course objectives:

This course will enable students to:

1. To understand working of Electric Vehicles and recent trends.
2. Ability to analyze different power converter topology used for electric vehicle application.
3. Ability to develop the electric propulsion unit and its control for application of electric vehicles.
4. Ability to design converters for battery charging and explain transformer less topology

Module – 1

Electric and Hybrid Electric Vehicles: Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains.

(8 Hours)

Module – 2

Energy storage for EV and HEV: Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Supercapacitors.

(8 Hours)

Module – 3

Electric Propulsion: EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives.

(8 Hours)

Module – 4

Design of Electric and Hybrid Electric Vehicles: Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design.

(8 Hours)

Module – 5

Power Electronic Converter for Battery Charging: Charging methods for battery, Termination methods, charging from grid, The Z-converter, Isolated bidirectional DC-DC converter, Design of Z- converter for battery charging, High-frequency transformer based isolated charger topology, Transformer less topology.

(8 Hours)

Course outcomes: The students will be able to:

CO1: Explain the working of electric vehicles and recent trends.

CO2: Explain different Energy storage technologies used for Electric and Hybrid Electric Vehicles application.

CO3: Analyze different power converter topology used for electric vehicle application

CO4: Develop the electric propulsion unit and its control for application of electric vehicles.

CO5: Design converters for battery charging and explain transformer less topology.

Question paper pattern:

SEE will be conducted for 50 marks.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks.
- The duration of the examination is 01 Hour.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).

The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks

1. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2005.
2. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, 2003.

References:

1. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric", Springer, 2013.
2. C.C. Chan and K.T. Chau, "Modern Electric Vehicle Technology", Oxford University, 2001.
3. Chris Mi, M. Abul, Masrur, David Wenzhong Gao, "Hybrid Electric Vehicles Principles and Applications with Practical Perspectives", Wiley Publication, 2011.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Electromagnetic Field Theory (3:0:0) 3

(Professional Elective - Group I)

(Effective from the academic year 2021 -2022)

Course Code	21EE542	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 different coordinate systems for understanding the concept of gradient, divergence and curl of a vector.
2. Study the application of Coulomb's Law and Gauss Law for electric fields produced by different charge configurations.
3. Evaluate the energy and potential due to a system of charges.
4. Study the behaviour of electric fields across a boundary between a conductor and dielectric and between two different dielectrics.
5. Study the magnetic fields and magnetic materials.
6. Study the time varying fields and propagation of waves in different media.

Module – 1

Vector Analysis: Scalars and Vectors, Vector algebra, Vector Components and unit vectors. Dot product and Cross product, coordinate systems: Cartesian coordinate system, cylindrical and spherical, relation between different coordinate systems. Numerical.

Electrostatics: Coulomb's law, Electric field intensity (vector form) and its evaluation for (i) point charge (ii) line charge (iii) surface charge (iv) volume charge EFI due to different types of charge distributions. Electric flux density, Gauss law and its applications. Maxwell's first equation (Electrostatics). Divergence theorem. Numerical.

(8 Hours)

Module – 2

Energy and Potential: Energy spent in moving charge, Definition of Potential Difference, Potential field due to Point Charge and System of Charge, Potential Gradient, Diploe, Energy Density in Electrostatic field. Numerical

Current and current density: Current and Current Density, Continuity of Current, Conductor Properties, and Boundary Conditions. Dielectric: Dielectric materials, boundary conditions. Numerical.

(8 Hours)

Module – 3

Poisson's and Laplace's equations: Derivations of Poisson's and Laplace's Equations, Uniqueness theorem. Numerical.

Steady magnetic fields: Biot - Savart's law, Ampere's circuital law. The Curl. Stokes theorem formula. Magnetic flux and flux density. Scalar and vector magnetic potentials. Numerical.

(8 Hours)

Module – 4

Magnetic forces: Force on a moving charge and differential current element. Force between differential current elements. Force and torque on a closed circuit. Numerical.

Magnetic materials and magnetism: Nature of magnetic materials, Magnetic boundary conditions. Magnetic circuit, inductance and mutual inductance. Numerical.

(8 Hours)

Module – 5

Time Varying Fields and Maxwell's Equations: Faraday's law, Displacement current. Maxwell's equations in point form and integral form. Numerical.
Uniform plane wave: Wave propagation in free space and in dielectrics. Pointing vector and power considerations. Propagation in good conductors, skin effect. Numerical.
Recap/summary of the course.

(8 Hours)

Course outcomes:

The students will be able to
CO1: Explain the concepts related to electrostatic and electromagnetic fields.
CO2: Apply Maxwell's equations to analyse the electrostatic and electromagnetic behaviour of conductors under different conditions.
CO3: Analyze the data related to Electromagnetic transmission norms, radiation hazards, effect on Environment, EMI and EMC to solve field theory problems.

Question paper pattern:

SEE will be conducted for 50 marks.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks.
- The duration of the examination is 01 Hour.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).

The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks:

1. Engineering Electromagnetics William H Hayt, J A Buck, MJaleelAkhtar Tata McGraw-Hill, 8th Edition, 2014.
2. Principles of Electromagnetics Matthew N. O. Sadiku Oxford 6th Edition, 2015.

References:

1. Electromagnetics with Applications, John Krauss and Daniel A Fleisch, McGraw-Hill, 5th Edition, 1999.
2. Field and wave electromagnetic", David K Chary, Pearson Education Asia, Second Edition – 1989, Indian Reprint – 2001.
3. Electromagnetism-Theory (Volume -1) -Applications (Volume-2) Ashutosh Pramanik PHI Learning 2014.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Advance Power Electronics (3:0:0) 3

(Professional Elective – Group I)

(Effective from the academic year 2021-22)

Course Code	21EE543	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Learn the techniques for design and analysis of dc –dc converters.
2. Explain the operation and frequency characteristics of resonant inverters and the techniques for zero voltage and zero-current switching.
3. Explain the operation and features of multilevel inverters, their advantages and disadvantages.
4. Explain the operation and analysis of the different types and circuit topologies of power supplies.
5. Explain the applications of power electronic devices in industry and residence.

Module – 1

Introduction: Significance and Scope of the course, Impact of the course on Societal Problems - Sustainable Solutions, Career Prospective, Latest research trends and innovations.

DC–DC Converters: Switching-Mode Regulators, Comparison of Regulators, Multi-output Boost Converter, Diode Rectifier-Fed Boost Converter, Averaging Models of Converters, State–Space Analysis of Regulators, Design Considerations for Input Filter and Converters, Drive IC for Converters.

(8 Hours)

Module – 2

Resonant Pulse Inverters: Introduction. Series Resonant Inverters, Frequency Response of Series Inverters, Parallel Resonant Inverters, Voltage Controlled Resonant Inverters, Class E Resonant Inverter, Class E Resonant Rectifier, Zero – Current Switching (ZCS) Resonant Converters, Zero Voltage Switching Resonant Converters (ZVS), Comparison between ZCS and ZVS Resonant Converters, Two Quadrant ZVS Resonant Converters, Resonant DC – Link Inverters.

(8 Hours)

Module – 3

Multilevel Inverters: Introduction, Multilevel Concept, Types of Multilevel Inverters, Diode – Clamped Multilevel Inverter, Flying - Capacitors Multilevel Inverter. Cascaded Multilevel Inverter, Applications, Features of Multilevel Inverters, Comparison of Multilevel Converters.

(8 Hours)

Module – 4

Power Supplies: Introduction, DC Power Supplies, AC Power Supplies, Multistage Conversions, Control Circuits, Magnetic Design Considerations.

(8 Hours)

Module – 5

Residential and Industrial Applications: Introduction, Residential Applications, Industrial Applications. Electrical Utility Applications: Introduction, High Voltage DC

Transmission, Static VAR Compensators, Interconnection of Renewable Energy Sources and Energy Storage systems to the Utility Grid, Active Filters.

Recap: The students will be able to appreciate the various power electronic converters and their applications in different converters.

(8 Hours)

Course Outcomes:

The students will be able to:

CO1: Analyze the techniques for DC -DC converters, resonant pulse inverters, multilevel inverters and power supplies.
CO2: Analyze residential and industrial applications of power electronic devices.
CO3: Design DC-DC converters and resonant pulse inverters.
CO4: Evaluate the performance parameters of DC-DC converters and resonant inverters

Question paper pattern:

SEE will be conducted for 50 marks.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks.
- The duration of the examination is 01 Hour.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).

The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks:

1. Mohammad H Rashid, "Power Electronics: Circuits Devices and Applications", Pearson, 4th Edition, 2014
2. Ned Mohan et al, "Power Electronics Converters, Applications and Design", Wiley, 3rd Edition, 2014

References:

1. Daniel W Hart, "Power Electronics", McGraw Hill, 1st Edition, 2011.
2. L. Umanand, "Power Electronics Essentials and Applications", Wiely India Pvt Ltd,Reprint,2012

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Electrical and Electronics Measurements (3:0:0) 3

(Professional Elective – Group I)

(Effective from the academic year 2021-22)

Course Code	21EE544	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 various types of bridges and apply them for the measurement of resistance, inductance and capacitances.
2. Understand about potentiometers and extending instrument ranges
3. Understand various meters working principles, construction and operation, characteristics for the measurement of power, energy, power factor and frequency
4. Understand about various types digital instruments and CROs working principles, construction and operation and characteristics for the measurement of different electrical quantities
5. Understand about working principles, construction, operation and characteristics of Signal Generators, display and recording devices

Module – 1

Measurement of Resistance: Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance measurement by fall of potential method and by using Megger.

Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance and capacitance bridge, Hay's bridge, Anderson's bridge, Desauty's bridge, Schering bridge. Problems. (8 Hours)

Module – 2

Measurement of Power, Energy, Power Factor and Frequency: Torque expression, Errors and minimization, UPF and LPF wattmeters. Measurement of real and reactive power in 3 phase circuits. Errors, adjustments and calibration of single and three phase energy meters, Problems. Construction and operation of single-phase and three phase dynamometer type power factor meter. Weston frequency meter and phase sequence indicator.

(8 Hours)

Module – 3

Extension of Instrument Ranges: Desirable features of ammeters and voltmeters. Shunts and multipliers. Construction and theory of instrument transformers, Desirable characterises, Errors of CT and PT. Turns compensation, Illustrative examples, Silsbee's method of testing CT.

Magnetic measurements: Introduction, measurement of flux/ flux density, magnetising force and leakage factor. (8 Hours)

Module – 4

Electronic and Digital Instruments: Introduction. Essentials of electronic instruments, Advantages of electronic instruments. True rms reading voltmeter. Electronic multimeters. Digital voltmeters (DVM) – Ramp type DVM, Integrating type DVM and Successive - approximation DVM. Q meter. Principle of working of electronic energy meter.

(8 Hours)

Module – 5

Display Devices: Introduction, character formats, segment displays, Dot matrix displays, Bar graph displays. Cathode ray tubes, Light emitting diodes, Liquid crystal displays, Nixes, Incandescent, Fluorescent, Liquid vapour and Visual displays.

Recording Devices: Introduction, Strip chart recorders, Galvanometer recorders, Null balance recorders, Bridge type recorders, LVDT type recorders, Circular chart and recorders. Digital tape recording, Ultraviolet recorders. Electro Cardio Graph (ECG).

(8 hours)

Course outcomes:

The students will be able to

CO1: Measure resistance, inductance and capacitance using bridges and determine earth resistance.

CO2: Explain the working of various meters used for measurement of Power, Energy & understand the adjustments, calibration & errors in energy meters.

CO3: Understand methods of extending the range of instruments & instrument transformers.

CO4: Explain the working of different electronic instruments, display and recording devices.

Question paper pattern:

SEE will be conducted for 50 marks.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks.
- The duration of the examination is 01 Hour.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).

The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks:

1. A. K. Sawhney, Electrical and Electronic Measurements and Instrumentation, Dhanpatrai and Sons, New Delhi.
2. Cooper D. and A.D. Heifrick, Modern Electronic Instrumentation and Measuring Techniques, PHI, 2009 Edition
3. H. S. Kalsi, Electronic Instrumentation, Tata Mcgrawhill, 3rd Edition, 2011

References:

1. David A. Bell, Electronic Instrumentation and Measurement, oxford Publication, 2nd Edition, 2009
2. Golding and Widdies, Electrical Measurements and Measuring Instruments, Pitman
3. G. K. Banerjee, Electrical and Electronic Measurements, PHI Learning Pvt. Ltd., 2ndEdition, 2016

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Sensors and Transducers (3:0:0)3

(Professional Elective Group – I)

(Effective from the academic year 2021-22)

Course Code	21EE545	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 need of transducers, their classification, advantages and disadvantages
2. Understand working of different types of transducers and sensors...
3. Understand recent trends in sensor technology and their selection
4. Understand the basics of signal conditioning and signal conditioning equipment.
5. Understand configuration of Data Acquisition System and data conversion
6. Understand measurement of various non-electrical quantities

Module – 1

Introduction to Sensors and Transducers: Significance and Scope, importance of the course in economic growth, Impact of the course on Societal Problems - Sustainable Solutions, Career Perspective, Latest research trends and innovations.

Classification of Transducers, Advantages and Disadvantages of Electrical Transducers, Transducers Actuating Mechanisms, Resistance Transducers, Variable Inductance Transducers, Capacitive Transducers.

(8 Hours)

Module – 2

Sensors and Transducers (continued): Piezoelectric Transducers, Hall Effect Transducers, Thermoelectric Transducers, and Photoelectric Transducers. Stain Gages, Load Cells, Proximity Sensors, Pneumatic Sensors, Light Sensors, Tactile Sensors, Fiber Optic Transducers.

(8Hours)

Module – 3

Sensors and Transducers (continued): Digital Transducers, Recent Trends – Smart Pressure Transmitters, Selection of Sensors, Rotary – Variable Differential Transform er, Synchros and Resolvers, Induction Potentiometers, Micro Electromechanical Systems.

Signal Condition: Introduction, Functions of Signal Conditioning Equipment, Amplification, Types of Amplifiers, Mechanical Amplifiers Fluid Amplifiers, Optical Amplifiers, Electrical and electronic Amplifiers.

(8 Hours)

Module – 4

Data Acquisition Systems and Conversion: Introduction, Objectives and Configuration of Data Acquisition System, Data Acquisition Systems, Data Conversion

Measurement of Non – Electrical Quantities: Pressure Measurement, Temperature Measurement, Flow Measurement.

(8 Hours)

Module – 5

Measurement of Non – Electrical Quantities (continued): Introduction, Electromagnetic Flow meters, Ultrasonic Flow Meters, Thermal Metes, and Wire Anemometers. Measurement of Displacement, Measurement of Velocity/ Speed, Measurement

of Acceleration, Measurement of Force, Measurement of Torque, Measurement of Shaft Power, Measurement of Liquid Level, Measurement of Viscosity

Recap of the following:

1. Different types of sensors and transducers, classification and applications 2. Signal conditioning systems 3. Data acquisition systems 4. Measurement of non-electrical quantities.

(8 Hours)

Course Outcomes:

The students will be able to

CO1: Classify, analyse and select transducers for different applications
CO2: Analyse the data conversion methods and data acquisition systems
CO3: Analyze, select transducers for the measurement of various non-electrical quantities

Question paper pattern:

SEE will be conducted for 50 marks.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks.
- The duration of the examination is 01 Hour.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).

The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks:

1. R.K Rajput S. Chand, "Electrical and Electronic Measurements and instrumentation", 3rd Edition, 2013

References:

1. J.B. Gupta, "A Course in Electronics and Electrical Measurements and Instruments", Katson Books, 13th Edition, 2008.
2. A. K. SawhenyDhanpat Rai, A. K. SawhenyDhanpat Rai, "A Course in Electrical and Electronic Measurements and Instrumentation", 2015.

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

GENERATION TRANSMISSION AND DISTRIBUTION (3:0:0)3

(Effective from the academic year 2021 -2022)

Course Code	21EE55	CIE Marks	50
Teaching Hours/Week (L: T:P)	3	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	3

Course objectives:

This course will enable students to:

1. Explain the arrangement and working operation of various methods of generation of power.
2. Understand the importance of sag and its calculation, design insulators and cables for given voltage level.
3. Calculate the parameters of the transmission line for different configurations and assess the performance of the line.
4. Evaluate AC distribution systems.

Module – 1

Generation

Hydroelectric Power Plants: Introduction, Selection of site, Classification of the plants based on water flow regulation, water head and type of load the plant has to supply.

Steam Power Plants: Introduction, Efficiency of steam plants, Merits and demerits of plants, selection of site. Working of steam plant, Power plant equipment and layout.

Nuclear Power Plants: Introduction, Economics of nuclear plants, Merits and demerits, selection of site, Nuclear reaction, Nuclear plant and layout.

Self Study : Diesel Power Plant, Gas Turbine Power Plant

(8 Hours)

Module – 2

Mechanical design of Transmission Lines- Calculation of sag in conductors i) At equal supports ii) At different level supports. Effect of ice covering and wind pressure, factors affecting sag. Overhead Line

Insulators-Types of insulators, potential distribution over a string of suspension insulators. String efficiency & methods of improving string efficiency.

Underground cables- Types of cables, constructional features, insulation resistance, thermal rating, charging current, grading of cables – capacitance and inter-sheath.

Self Study : Standard voltages, Advantages of high voltage transmission. Types of conductors

(8 Hours)

Module – 3

Line parameters-Calculation of inductance of single phase, 3 phase line with equilateral & unsymmetrical spacing (transposed), calculation of capacitance of a single-phase line, 3 phase line with symmetrical and unsymmetrical spacing (transposed) without considering the effect of earth on transmission line capacitance.

(8 Hours)

Module – 4

Performance of power transmission lines- Classification of lines, Short Transmission lines, medium Transmission lines - nominal T method, nominal π method and long transmission

lines – Rigorous solution method, ABCD constants of Transmission lines, calculation of voltage regulation and transmission efficiency.

(8 Hours)

Module – 5

Distribution systems - Primary AC distribution systems – Radial feeders, parallel feeders, loop feeders and interconnected network system. Secondary AC distribution systems – Three phase 4 wire system and single phase 2 wire distribution, AC distributors with concentrated loads. Effect of disconnection of neutral in a 3 phase four wire system.

Summary : Recap of generation system, Selection of conductors, insulators, Transmission distribution analysis.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Describe the working of hydroelectric, steam, nuclear power plants and state functions of major equipment of the power plants.

CO2: Analyze cable capacity, insulators for a given voltage level and calculate the sag for different line supports.

CO3: Analyze mathematical models of the transmission line with different configurations and determine the line parameters and assess the performance of the line

CO4: Analyze and distinguish different distribution system topologies.

Question paper pattern:

SEE will be conducted for 50 marks.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks.
- The duration of the examination is 01 Hour.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).

The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks

1. S.Sivanagaraju S.Satyanarayana, "Electrical Power Transmission and Distribution", Pearson Education, 2009.
2. J.B.Gupta, "Transmission and Distribution of Electrical Power", S.K.Kataria and sons, 10th edition,2012

References:

1. W.D. Stevenson, "Elements of Power System Analysis", Mc.Graw - Hill. Comp.Ltd, 1994.
2. Dr. S. N. Singh, "Electric power generation Transmission & Distribution", PHI learning Pvt Ltd, New Delhi, 2nd Edition,2010.
3. C.L.Wadhwa, "Electrical Power Systems", New Age International publishers, 6th Edition, 2013.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

MICROCONTROLLERS(3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21EE56	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. Explain the internal organization and working of Microprocessors, microcontrollers and Embedded processors.
2. Compare and contrast the various members of the 8051 family.
3. Explain the registers of the 8051 microcontroller, manipulation of data using registers and MOV instructions.
4. Explain in detail the execution of 8051 Assembly language instructions and data types
5. Explain loop, conditional and unconditional jump and call, handling and manipulation of I/O instructions.
6. Explain different addressing modes of 8051, arithmetic, logic instructions, and programs.
7. Develop 8051 C programs for time delay, I/O operations, I/O bit manipulation, logic, arithmetic operations and data conversion.
8. Develop 8051 C programs for interfacing with external devices like relays, motors, display systems and sensors etc.,.

Module – 1

Introduction to Embedded Systems: History & need of Embedded System , Basic components of Embedded System, Embedded System Market Analysis by product (Hardware, Software), by Application (Automotive, Telecommunication, Healthcare, Industrial, Consumer Electronics, Military and Aerospace).

8051 Microcontroller Basics: Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins of 8051. 8051 Addressing Modes.

(8 Hours)

Module – 2

Assembly programming and instruction of 8051: Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

(8 Hours)

Module – 3

8051 programming in C: Data types and time delay in 8051 C, IO programming in 8051C, Logic operations in 8051 C, Data conversion program in 8051 C, accessing code ROM space in 8051C, Data serialization using 8051 C

8051 Timer programming in C: Programming 8051 timers, counter programming, Programming timers 0 and 1 in 8051 C.

(8 Hours)

Module – 4

8051 serial port programming in C: Basics of serial communication, 8051 connections to RS232, 8051 serial port programming in 8051 C.

8051 Interrupt programming in C: 8051 interrupts, Programming timer, external hardware interrupts, serial communication using interrupts, Interrupt priority in 8051/52, Interrupt programming in C.

(8 Hours)

Module – 5

Interfacing: LCD interfacing, Keyboard interfacing.

ADC, DAC and sensor interfacing: ADC 0808 interfacing to 8051, Serial ADC Max1112 ADC is interfacing to 8051, DAC interfacing, Sensor interfacing and signal conditioning.

Motor control: Relay, PWM, DC and stepper motor: Relays and opt isolators, stepper motor interfacing, DC motor interfacing and PWM.

Recap/summary of the course.

(8 Hours)

Course outcomes:

The students will be able to

CO1: Analyze the internal organization and working of microcontrollers

CO2: Design and develop programs for data manipulations, arithmetic and logical operations

CO3: Design and develop programs for using timers, interrupts and serial communication

CO4: Design and develop programs for interfacing input/output devices

Question paper pattern:

SEE will be conducted for 50 marks.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks.
- The duration of the examination is 01 Hour.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).

The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks:

1. Ramesh S Gaonkar, "Microprocessor Architecture: Programming and Applications with the 8085",Penram International Publishing, Prentice Hall of India, New Delhi, 2011.
2. Muhammed Ali Mazidi, Janice GillispieMazidi, Rolin D Mckinlay, "The 8051 Microcontroller andEmbedded Systems", Pearson Education India, New Delhi, 2011
3. Kenneth Ayala, "The 8051 Microcontroller", Cengage Learning, 3rd Edition, 2005

References:

1. Manish K Patel, "The 8051 Microcontroller Based Embedded Systems", McGraw Hill, 2014, ISBN: 978-93-329-0125-4.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

OP-AMP and Linear ICs (3:0:0)3

(Effective from the academic year 2021-22)

Course Code	21EE57	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 basics of Linear ICs such as Op-amp, Regulator, Timer & PLL
2. Learn the designing of various circuits using linear ICs.
3. Use these linear ICs for specific applications
4. Understand the concept of various types of converters

Module – 1

Introduction: Significance and Scope of the course, Impact of the course on Societal Problems - Sustainable Solutions, Career Prospective, Latest research trends and innovations.

Operational Amplifier: Introduction, Block Diagram, Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters, Ideal Op-Amp, Equivalent Circuit of Op-Amp, ideal voltage transfer curve, Open Loop Op-Amp configurations - Differential Amplifier, Inverting & Non Inverting Amplifier, Op-Amp with negative feedback (excluding derivations).

OP-AMP Linear Applications: A.C. amplifier, summing, scaling & averaging amplifier with inverting and non-inverting configuration, Instrumentation amplifier.

(8 Hours)

Module – 2

Precision Rectifiers and Signal Processing Circuits: Introduction, precision half wave rectifier: saturating precision rectifier, non-saturating precision rectifier, precision full wave rectifiers: half wave rectifier and summing circuit.

Signal Generators: Phase shift oscillator, Wein bridge oscillator, Square wave generator, triangular wave generator.

(8 Hours)

Module – 3

Comparators & Converters: Basic comparator, zero crossing detector, inverting & non-inverting Schmitt trigger circuit, voltage to current converter with grounded load, current to voltage converter.

DC Voltage Regulators: Voltage regulator basics, voltage follower regulator, adjustable output regulator, LM317 & LM337 Integrated circuits regulators.

(8 Hours)

Module – 4

Active Filters: Introduction, First and second order active low pass filter, first and second order active high pass filter, Band pass filter, Band elimination filter, All pass filter.

A-D & D-A Converters: Basics, R–2R D/A Converter, Integrated circuit 8-bit D/A, successive approximation ADC, linear ramp ADC.

(8 Hours)

Module – 5

555 Timer: 555 Timer block diagram, 555 timer as a monostable multivibrator, monostable multivibrator applications, 555 timer as an astable multivibrator, astable multivibrator applications.

Phase locked loops: Introduction, basic PLL, phase detector, Low pass filter, voltage-controlled oscillator, performance factors.
Recap: The summary of basics of IC 741, 555 timer and PLL and their linear and nonlinear applications.

(8 Hours)

Course Outcomes:

The students will be able to

CO1. Explain the basics of linear ICs.
CO2. Design circuits using linear ICs.
CO3. Analyse the applications of linear ICs.
CO4. Demonstrate the application of linear ICs in the electronic projects.

Question paper pattern:

SEE will be conducted for 50 marks.

- The question paper will have 50 questions. Each question is set for 01 mark.
- SEE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks.
- The duration of the examination is 01 Hour.

CIE will be announced prior to the commencement of the course.

- Three Unit Tests each of **20 Marks** (Duration 01 hour).
- Two assignments each of 10 Marks.
- Two alternate assessment tools (AATs) for **20 Marks** (duration 01 hour).
- The sum of three tests, two assignments, and AATs will be out of 100 marks and will be scaled down to 50 marks.

Textbooks:

1. David A Bell, "Opamps and Linear ICs", Prentice-Hall Publications, New age Publication, 3rd edition, 2011
2. Ramakanth A Gayakwad, "Op-Amps and Linear Integrated Circuits", PHI, 4th edition, 2015

References:

1. S. Salivahanan& V.S. Kanchana Bhaaskaran, Linear Integrated Circuits-2e, Tata McGraw - Hill Publication, 2nd edition, 2014
2. D Roy Choudhury & Shail B Jain, Linear Integrated circuits, New Age Publication, 2010

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Microcontrollers Laboratory (0:0:3) 1

(Effective from the academic year 2021-22)

Course Code	21EEL58A	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:3	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course objectives:

This course enables students to:

1. To explain writing assembly language programs for data transfer, arithmetic, Boolean and logical Instructions.
2. To explain writing assembly language programs for code conversions.
3. To explain writing assembly language programs using subroutines for generation of delays, counters, configuration of SFRs for serial communication and timers.
4. To perform interfacing of stepper motor and dc motor for controlling the speed.
5. To explain generation of different waveforms using DAC interface

List of Experiments

PART A

8051 assembly programming

1. Data transfer – Program for block data movement, sorting, exchanging, finding largest element in an array.
2. Arithmetic instructions: Addition, subtraction, multiplication and division. Square of numbers
3. Counters
4. Boolean and logical instructions (bit manipulation)
5. Conditional call and return instructions.
6. Code conversion programs – BCD to ASCII, ASCII to BCD, Hexa-decimal to Decimal and Decimal to Hexa-Decimal.
7. Programs to generate delay, Programs using serial port and on-chip timer/counters.

PART B

Interfacing Programs

1. i) Stepper motor interface and ii) DC motor interface for direction and speed control using PWM.
2. Generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface.
3. Elevator interface.

Open ended Experiments:

4. Traffic Light implementation using 8051 microcontrollers.
5. Alphanumerical LCD panel interface.

Course outcomes:

The students will be able to:

CO1: Develop assembly language programs for data transfer, arithmetic operations, code conversions.

CO2: Develop Assembly Language Programs using subroutines for timers, counters, communications and interrupts.

CO3: Develop C programs for timers, counters, communications and interrupts.

CO4: Develop C programs for interfacing with external devices like relays, motors, displays.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

OP-AMP and Linear ICs Laboratory (0:0:3) 1

(Effective from the academic year 2021-22)

Course Code	21EEL58B	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:3	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course objectives:

This course enables students to:

1. Design and conduct experiments using OP-AMPs
2. Design and conduct experiments using Linear IC's

List of Experiments

PART A

1. Voltage follower, Inverting and non-inverting amplifier
2. Inverting and non-inverting summing amplifier and difference amplifier
3. Precision half wave and full wave rectifier
4. Phase shift oscillator
5. Voltage comparator and Zero crossing detector
6. Schmitt trigger
7. Linear ICs as voltage regulator

PART B

1. First order active low pass and high pass filter
2. First order active Bandpass filter
3. Digital to Analog converter
4. Analog to Digital converter
5. 555 timer as Astable and Monostable multivibrator

Open Ended Experiment:

1. Function generator

Course outcomes:

The students will be able to:

CO1: Design linear circuits using Op-Amp

CO2: Design non linear circuits using Op-Amp

CO3: Design oscillators and filters using the Op-Amp

CO4: Design multivibrator and voltage regulator using Linear ICs

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Embedded System Design Laboratory (0:0:3) 1

(Effective from the academic year 2021-22)

Course Code	21EEL58C	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:3	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course objectives:

This course enables students to:

1. To write Embedded C/C++ programs for Arduino based embedded systems.
2. To write Embedded C/C++ programs for data transfer, arithmetic, Boolean and logical Instructions.
3. To design embedded software systems for display systems.
4. To design embedded software systems for keyboard systems.
5. To design embedded communication systems.
6. To design Analog/Digital sensor data acquisition systems
7. To design motor control systems.

List of Experiments

PART A

Embedded System Design Lab

1. Programming in Embedded C, ARDUINO History and Family.
2. General Hardware Interfacings, LEDS, Switches and Matrix Keypad.
3. Seven Segment Display and Multi Segment Display systems
4. Relay and LCD control system
5. Buzzer, IR Sensors and other digital sensors interfacing systems.
6. Analogue Sensor Systems
7. Real time clock system
8. Serial/I2C communications with embedded systems to PC and vice versa.
9. Gyro/Accelerometer system
10. Electrical Motor Control system.

PART B

Open ended Experiments:

1. Automatic vehicle counting and Traffic Light system
2. Water Level Controller
3. Stepper and Servo motor control systems
4. Generating different waveforms: sine, square, triangular, ramp using DAC interface
5. Elevator Interface
6. Digital lock system

Course outcomes:

The students will be able to:

CO1: Design and Develop C/C+ programs for Arduino based systems.

CO2: Design and Develop key board/display systems.

CO3: Design and Develop analog/digital sensor data acquisition systems.

CO4: Design and Develop Motor control.