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

Approved in the BoS meeting held on 23.08.2024

V and VI Semester Scheme and Syllabus
2022 Scheme - Autonomous

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.**

ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮತ್ತು ವ್ಯವಸ್ಥಾಪನಾ ಮಹಾವಿದ್ಯಾಲಯ
BMS Institute of Technology and Management
(An Autonomous Institution, Affiliated to VTU Belagavi)
Avalahalli, Doddaballapur Main Road, Bengaluru, Karnataka – 560064

Ref.: BMSIT&M/Exam/2023-24/ 104 **Date:** 21.09.2024

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

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

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

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

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

INTEGRATED PROFESSIONAL COMPETENCE COURSE (IPCC) COURSES **4 OR 3 CREDITS**						
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Theory Component	CIE - Internal Assessment (IA) Tests	CIE – Test 1 (1.5 hr)	40	20	-	The sum of the two internal assessment tests will be **80 Marks** and the same shall be scaled down to **20 Marks**.
		CIE – Test 2 (1.5 hr)	40			
	CIE – CCA (Comprehensive Continuous Assessment)	CCA	10	10	-	Any one assessment method can be used from the list appended below.
	Total CIE Theory			**30**	**12**	
Practical Component	CIE - Practical		30	10	-	Each laboratory experiment is to be

					assessed for **30 Marks** using appropriate rubrics.
	CIE Practical Test	20	10	-	One test after all experiments to be conducted for **20 Marks**
	Total CIE Practical		**20**	**08**	
Total CIE Theory + Practical			**50**	**20**	
SEE		100	50	18	SEE exam is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.**
CIE + SEE			**100**	**40**	
Note: The assessment of the laboratory component for the IPCC courses shall be restricted to CIE only.					

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

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

PROFESSIONAL CORE COURSE LABORATORY (PCCL) /ABILITY ENHANCEMENT COURSE LABORATORY (AEC) **01 CREDIT**					
Evaluation Type	**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Continuous Internal Evaluation	CIE - Practical	30	30		Each laboratory experiment is to be evaluated for **30 Marks** using appropriate rubrics.
	CIE - Practical Test	50	20		One test after all experiments is to be conducted for **50 Marks** and to be scaled down to **20 Marks**.
	Total CIE	-	**50**	**20**	
Semester End Examination		100	50	18	SEE to be conducted for **100 Marks**.
CIE+SEE		**100**		**40**	

NON-IPCC / ABILITY ENHANCEMENT COURSE (AEC) **01 CREDIT – DESCRIPTIVE TYPE**						
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Theory Component	CIE – IA Tests	CIE – Test 1 (1.5 hr)	40	30	-	The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **30 Marks**.
		CIE – Test 2 (1.5 hr)	40			
	CIE - CCAs	CCA	20	20	-	Any Two assessment methods can be used from the list. If it is project-based, one CCA shall be given.
	Total CIE Theory			**50**	**20**	

SEE	100	50	18	SEE is a theory exam, conducted for **100 Marks for 02 Hours duration**, scored marks are scaled down to **50 Marks.**
CIE + SEE		**100**	**40**	

COMPUTER AIDED ENGINEERING DRAWING (BCEDK103/BCEDK203)
3 CREDIT

Evaluation Type		Topics/ Modules	Computer Printout	Preparatory Sketch	Max Marks	Total Marks	Marks to be Scaled Down to	Min Marks to Pass
CIE	**Sketch Book and CAD Modelling**	Projection of Points	10	05	15	200	20	-
		Projection of Lines	10	10	20			
		Projection of Planes	20	15	35			
		Projection of Solids	40	20	60			
		Isometric Projections	20	15	35			
		Development of lateral surfaces	20	15	35			
	Test 1	Module 1 & 2	24	06	30	70	20	-
		Module 3	32	08	40			
	Test 2	Module 3	32	08	40	70		
		Module 4	24	06	30			
	CCA 1	Module 5	08	02	10	10	10	-
	CCA 2	Module 5	08	02	10			
CIE Total							**50**	**20**
SEE		Module 1 & 2	24	06	30	100	**50**	**18**
		Module 3	32	08	40			
		Module 4	24	06	30			
CIE + SEE							**100**	**40**

COMPUTER AIDED MODELLING FOR MANUFACTURING (BME305) **1 CREDIT**								
Evaluation Type		**Topics/ Modules**	**Computer Printout**	**Preparatory Calculations / Sketch**	**Max Marks**	**Total Marks**	**Marks to be Scaled Down to**	**Min Marks to Pass**
CIE	**Sketch Book and CAD Modelling**	Module 1	60	30	90	200	20	
		Module 2	40	20	60			
		Module 3	40	10	50			
	Test 1	Module 1	20	10	30	60	20	-
		Module 2	20	10	30			
	Test 2	Module 1	20	10	30	60		
		Module 3	20	10	30			
	CCA	Module 1	30	10	40	40	10	-
CIE Total							**50**	**20**
SEE		Module 1	30	10	40	100	**50**	**18**
		Module 2	20	10	30			
		Module 3	20	10	30			
CIE + SEE							**100**	**40**

Learning Activities for CCAs:

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

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

CoE 21/09/2024

Dean - AA 21/09/24

21/9/2024

Principal

Copy To:

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

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institution Affiliated to VTU, Belagavi)

B. E. in Electrical & Electronics Engineering

Scheme of Teaching and Examinations – 2022 Scheme

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

(Effective from the academic year 2022-23 onwards)

V Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Credits Distribution				Examination				Contact Hours/week
					L	T	P	Total	CIE Marks	SEE Marks	Total Marks	SEE Duration (H)	
1	HSMC	BEE501	Management and Electrical Economics	TD: EE PSB: EE	3	0	0	3	50	50	100	3	3
2	IPCC	BEE502	Signal Processing		3	0	1	4	50	50	100	3	4
3	PCC	BEE503	Power Electronics		4	0	0	4	50	50	100	3	4
4	PCCL	BEEL504	Power Electronics Laboratory		0	0	1	1	50	50	100	2	2
5	PEC	BEE505X	Professional Elective Course I		3	0	0	3	50	50	100	3	3
6	PW	BEE506	Mini Project		0	0	3	3	50	50	100	3	6
7	AEC	BRMK507	Research Methodology and IPR	Any Department	2	0	0	2	50	50	100	3	2
8	MC	BESK508	Environmental Studies	TD: CV PSB: CV	1	0	0	1	50	50	100	1	1
9	NCMC	BNSK509	National Service Scheme (NSS)	NSS Coordinator	0	0	0	0	100	-	100	-	2
		BPEK509	Physical Education (Sports and Athletics)	PED									
		BYOK509	Yoga	Yoga Teacher									
		BNCK509	National Cadet Corps (NCC)	NCC officer									
		BMUK509	Music	Music Teacher									
TOTAL								**21**	**500**	**400**	**900**	**-**	

HSMC: Humanities, Social Sciences and Management Course, **IPCC**: Integrated Professional Core Course, **PCC**: Professional Core Courses, **PCCL**: Professional Core Course laboratory, **PEC:** Professional Elective Course, **PW:** Project Work, **AEC**: Ability Enhancement Course, **MC:** Mandatory Course, **NCMC**: Non Credit Mandatory Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation.

Professional Elective Course I			
Course Code	**Course Name**	**Course Code**	**Course Name**
BEE505A	High Voltage Engineering	BEE505C	Sensors and Transducers
BEE505B	Fundamentals of VLSI	BEE505D	Special Electric Motors

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

National Service Scheme /Physical Education/Yoga/NCC/Music: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), Yoga (YOG), National Cadet Corps (NCC) and Music with the concerned coordinator of the course during the beginning of each semester starting from III semester to VII semester. In every semester, students should choose any one mandatory course among the available 5 courses without repeating the course again. Activities shall be carried out in each of the semesters from III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

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

Mini Project: The Mini Project Work is a part of the curriculum in the pre-final year. Mini Project is a course which will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications. Based on the ability/abilities of the student/s and recommendations of the mentor, a Mini- project can be assigned to a group having not more than 4 students. A comprehensive report is to be prepared after completion of the project work.

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

MANAGEMENT AND ELECTRICAL ECONOMICS (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	**BEE501**	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 planning skills.
2. Understand the structure of organisation.
3. Understand the economics of power factor.
4. Learn on tariffs.
5. Understand on depreciation and valuation of an organisation and industry unit.

Preamble: Through the creation of the optimal organisational structure and the wise use of the resources that are available, management plays a crucial role in raising the standard of living for members of society. Managers may approach organisational and societal issues more realistically and identify practical solutions when they are knowledgeable about management theory and practice.

Module – 1

PERSONNEL MANAGEMENT: Introduction - Scientific Management - Types of management - Objectives and functions of personnel management, Recruitment of personnel - Selection of personnel - Training of personnel - Employer and employee relationship - Industrial disputes. 8 Hours

Module – 2

PRODUCTION MANAGEMENT: Introduction - Plant location - Plant layout - Types of layouts - PERT and CPM - Line balancing -Automation - Statistical quality control - Control charts - Motion study. 8 Hours

Module – 3

ECONOMICS OF POWER FACTOR IMPROVEMENT: Introduction - Definition of p.f - Disadvantages, causes and avoidance of low power factor - P.F improvement using static capacitors and synchronous condensers - Economics of p.f improvement when kW demand is constant and when kVA demand is constant. 8 Hours

Module – 4

TARIFFS: Introduction - Tariff -Aims and objectives - Factors governing a tariff - Requirements of good tariff - Types of tariffs.

DEPRECIATION AND VALUATION

Introduction - Types of depreciation - Methods of calculating depreciation - Inventory - Economic order quantity- Break-even analysis. 8 Hours

Module – 5

CHOICE OF PLANTS AND ECONOMIC SELECTION- Introduction - Methods of selection - Annual cost basis - Present worth method - Unit cost basis - MAPI method - Payback period method - Rate of return method. 8 Hours

Course Outcomes:

The students will be able to:

CO1:	Recognise the requirements, roles, duties, scope, and development of

	management.
CO2:	Discuss Decision making, Organizing, Staffing, Directing and Controlling.
CO3:	Select the best economic model from various available alternatives.
CO4:	Understand various interest rate methods and implement the suitable one.
CO5:	Estimate various depreciation values of commodities

Textbooks:

1. Principles of Management by Tripathy and Reddy
2. Introduction to Management – S S Chatterjee.
3. Engineering Economics and Management N. Narasimhaswamy.

References:

1. Management Fundamentals - Concepts, Application, Skill Development - Robers Lusier – Thomson.
2. Essential Concepts and Applications, Pearson Education, Robbins S.P. and Decenzo David A.
3. Industrial Organization and Engineering Economics T R Banga & S C Sharma

Alternate Assessment Tools (AATs) suggested:

- Group Presentation on Management skills.
- MOOC Course**.**

Web links / e – resources:

1. **. https://www.academia.edu/15000287/INTRODUCTION_TO_MANAGEMENT**
2. **https://www.studocu.com/in/document/pondicherry-university/engineering-economics-and-management/unit3-engineering-economics-and-management-lecture-notes/38782991.**

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

SIGNAL PROCESSING (3:0:1) 4

(Effective from the academic year 2024-25)

Course Code	**BEE502**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:1	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3

Course Objectives:

This course will enable students to:

1. To explain basic signals, their classification, basic operations on signals, sampling of analog signals, and the properties of the systems.
2. To explain the convolution of signals in continuous and discrete time domain and the properties of impulse response representation.
3. To explain the computation of Discrete Fourier Transform of a sequence by direct method, Linear transformation Method and using Fast Fourier Transformation Algorithms.
4. To explain design of IIR all pole analog filters and transform them into digital filter using Impulse Invariant and Bilinear transformation Techniques and to obtain their Realization.
5. To explain design of FIR filters using Window Method and Frequency Sampling Method and to obtain their Realization.

Preamble:

Digital Signal Processing (DSP) utilizes digital techniques and computing devices for signal processing, distinguishing it from analog methods. Despite its greater complexity and the loss of resolution inherent in analog-to-digital conversion, DSP offers unconditional stability. Digital signals can be stored, transmitted, and reproduced accurately. This course explores DSP theory and imparts practical knowledge necessary for understanding signals and the systems which operate on these signals. The global digital signal processor (DSP) market was valued at $11.47 billion in 2023 and is expected to reach $22.49 billion by 2033.

Module – 1

Signals basics: Signals, systems and signal processing, classification of signals, Basic Operations on Signals, Basic Elementary Signals, properties of systems. concept of frequency in continuous and Discrete time signals, sampling of analog signals, the sampling theorem

Time-domain representations for LTI systems: Convolution, impulse response representation, Convolution Sum and Convolution Integral, properties of impulse response representation, solution of difference equations. (8 Hours)

Module – 2

Discrete Fourier Transforms:

Introduction to DFT, definition of DFT and its inverse, matrix relation to find DFT and IDFT, Properties of DFT, linearity, circular time shift, circular frequency shift, circular folding, DFT of complex conjugate sequence, multiplication of two DFTs- the circular convolution, Parseval's theorem, Signal segmentation: overlap-save and overlap-add method. (8 Hours)

Module – 3

Fast-Fourier-Transform algorithms: Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms), speed improvement factor, Radix-2 FFT algorithm for the computation of DFT and IDFT–decimation-in-time and Decimation-in-frequency algorithms, FFT for Composite value of N (No numerical on composite N) (8 Hours)

Module – 4	
IIR Filter Design: Classification of analog filters, generation of Butterworth polynomials, frequency transformations. Design of Butterworth filters, low pass, high pass, band pass and band stop filters, Generation of Chebyshev polynomials, design of Chebyshev filters, design of Butterworth and Chebyshev filters using bilinear transformation and Impulse invariance method, representation of IIR filters using direct form one and two, series form. (8 Hours)	
Module – 5	
FIR filter design: Introduction to FIR filters, symmetry and antisymmetric FIR filters, design of linear phase FIR filters using - Rectangular, Bartlett, Hamming, Hanning and Blackman windows, design of FIR differentiators, FIR filter design using frequency sampling Technique. Representation of FIR filters using direct form and lattice structure. (8 Hours)	
Practical components for IPCC	
Sl. No.	**Experiments**
1.	Verification of Sampling Theorem in time and frequency domains
2.	Generation of different signals in both continuous and discrete time domains
3.	To perform basic operations on given sequences- Signal folding, evaluation of even and odd signals
4.	Evaluation of impulse response of a system.
5.	Solution of a difference equation.
6.	Evaluation of linear convolution and circular convolution of given sequences
7.	Computation of N- point DFT and IDFT of a given sequence by use of (a) Defining equation; (b) FFT method
8.	Evaluation of circular convolution of two sequences using the DFT and IDFT approach.
9.	Design and implementation of IIR filters to meet given specification (Low pass, high pass, band pass and band reject filters).
10.	Design and implementation of FIR filters to meet given specification (Low pass, high pass, band pass and band reject filters) using different window functions.
11.	Design and implementation of FIR filters to meet given specification (Low pass, high pass, band pass and band reject filters) using frequency sampling technique.
12.	Realization of IIR and FIR filters.
Course Outcomes: The students will be able to:	
CO1:	Classify the signals and understand the sampling theorem.
CO2:	Apply Fourier Transform techniques to a signal and perform operations
CO3:	Design IIR and FIR digital filters from basic specifications
CO4:	Conduct experiments and, interpret the results on the signals and systems

Textbooks:

1. Digital Signal Processing, A. Nagoor Kani McGraw Hill 2nd Edition, 2012
2. Digital Signal Processing, Ashok Amberdar, Cengage Publications 1stEdition, 2007

References:

1. Digital Signal Processing – Principles, Algorithms, and Applications, John G. Proakis, Dimitris G. Manolakis, Pearson 4th Edition, 2007.
2. Introduction to Digital Signal Processing Johnny R. Johnson Pearson 1st Edition, 2016.
3. Digital Signal Processing - A Practical Approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009.
4. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007.

Alternate Assessment Tools (AATs) suggested:

- Obtaining the FFT and further analysis of a given signal
- Filter design and its application on an audio signal

Web links / e – resources:

1. https://www.youtube.com/watch?v=6dFnpz_AEyA NPTEL Lectures on DSP
2. **https://github.com/openlists/DSPResources**
3. **https://www.analog.com/en/resources/technical-books/scientist_engineers_guide.html**

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

POWER ELECTRONICS (4:0:0) 4

(Effective from the academic year 2024-25)

Course Code	**BEE503**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:1:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3

Course Objectives:

This course will enable students to:

1. To give an overview of applications of power electronics, different types of power semiconductor devices, their control characteristics.
2. To explain the analysis techniques of diode circuits and single phase diode rectifier circuits.
3. To explain different power transistors, its steady state and switching characteristics.
4. To explain Thyristors characteristics, its gate characteristics and gate control requirements.
5. To Explain the analysis techniques, performance parameters and characteristics of controlled rectifiers, AC Voltage controllers, DC- DC and DC -AC converters.

Preamble:

Power electronics is the study of electronic circuits for the control, conversion and conditioning of electrical energy using solid state semiconductor devices. In power electronics, the focus is on power processing at the highest efficiency possible using a very small control signal. Power electronics has applications that span the whole field of electrical power system. In this course important power semiconductors devices are explored and the power electronic converters are analysed. The global power electronics market reached a value of US$ 31.3 Billion in 2023 and grow at a CAGR of 5.3% to reach US$ 50.4 Billion by 2032.

Module – 1

Power semiconductor devices: Introduction, types of power electronic circuits, peripheral effects, power semiconductor devices, control characteristics of power devices, device choices, applications of power electronics.

Power Diodes: Introduction, reverse recovery characteristics, diode types, diode circuits with DC source connected to R and RL load, single-phase full-wave rectifiers with R load , single-phase full-wave rectifier with RL Load. 10 hours

Module – 2

Power Transistors: Introduction, Bipolar Junction Transistors: steady state characteristics, switching characteristics, switching limits. Power MOSFET: steady state characteristics, switching characteristics. IGBTs: steady state characteristics, switching characteristics.

Gate Drive Circuits: MOSFET gate drive circuits, isolation of gate drives, pulse transformers and opto-couplers. 10 hours

Module – 3

Thyristors: Introduction, Thyristor characteristics, two- transistor model, thyristor turn-on and turn-off, series and parallel operation of thyristors, di/dt and dv/dt protection, thyristor firing circuit using unijunction transistor. 10 hours

Module – 4

Controlled Rectifiers: Introduction, single-phase full wave converter with R & RL load, single-phase full wave converter with RL load and freewheeling diode, single-phase semi converter,

single-phase dual converter, three-phase full wave converter.

AC Voltage Controllers: Introduction, principle of phase control & integral cycle control, single phase full wave controllers with resistive load, single-phase full-wave controllers with inductive load. 10 hours

Module – 5

DC-DC Converters: Introduction, performance parameters, principle of step-down operation, step down converter with RL load, principle of step up operation, step-up converter with R load, converter classification.

DC-AC Converters: Introduction, principle of operation, performance parameters, single phase half and full- bridge inverter, three-phase inverters, voltage control of single phase inverter. 10 hours

Course Outcomes:

The students will be able to:

CO1:	Explain the operation and characteristics of power semiconductor devices and its applications.
CO2:	Study gate control and protection circuits of power semiconductor devices.
CO3:	Analyse the operation of different power converters.
CO4:	Evaluate the output voltage, output current and performance parameters of power converters.

Textbooks:

1. M. H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson, 4th Edition, 2014.
2. P. S. Bimbhra, "Power Electronics", Khanna Publishers, 5th Edition, 2012.

References:

1. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics converters, applications and design", Wiley, 3rd Edition, 2014.
2. Vedam Subramanyam, "Power Electronics", New Age International Publishers, Revised 2nd Edition, 2006.
3. M. D. Singh, Khanchandhani K. B, "Power Electronics", TMH, 2nd Edition, 2008.
4. Joseph Vithayathil, "Power Electronics – Principles and Applications", TMH, 2010.

Alternate Assessment Tools (AATs) suggested:

- Simulation of power electronic converters using MATLAB Simulink/PSIM
- Seminar on applications of power electronics

Web links / e – resources:

1. https://nptel.ac.in/courses/108101038 NPTEL Lecture videos on Power Electronics
2. http://nptel.ac.in/courses/108105066 NPTEL Lecture notes on Power Electronics
3. https://education.ni.com/teach/resources/774/power-electronics-fundamentals

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER - V

POWER ELECTRONICS LABORATORY (0:0:1) 1

(Effective from the academic year 2024 -2025)

Course Code	**BEEL504**	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:1	SEE Marks	50
Total Number of Lecture Hours	16	Exam Hours	2

Laboratory Prerequisites:

1. Knowledge about characteristics of power semiconductor devices.
2. Knowledge about thyristor firing circuits.
3. Knowledge about power electronic converter circuits.

Laboratory Objectives:

1. To conduct experiments on power semiconductor devices to obtain their static characteristics.
2. To study the methods of triggering the SCR and TRIAC.
3. To study the performance of single phase controlled full wave rectifier, AC voltage controller and single phase full bridge inverter with R and RL loads.
4. To control the speed of a DC motor and universal motor.

Laboratory Course Outcomes:

This course will enable students to

1. Obtain static characteristics of semiconductor devices and discuss their performance.
2. Trigger the power semiconductor devices by different methods.
3. Verify the performance of single phase controlled full wave rectifier, AC voltage controller and single phase full bridge inverter with R and RL loads.
4. Control the speed of a dc motor, universal motor and stepper motor.

Experiments:

1. Static characteristics of SCR
2. Static characteristics of TRIAC
3. Static characteristics of MOSFET and IGBT
4. Single phase controlled full wave rectifier with R load & R –L load with and without freewheeling diode
5. Speed control of a universal motor using an AC voltage regulator
6. AC voltage controller using TRIAC and DIAC combination connected to R & RL load
7. SCR turn-on circuit using synchronized UJT relaxation oscillator
8. Speed control of a separately excited DC motor using IGBT or MOSFET chopper
9. Speed control of DC motor using single phase semi converter
10. Single phase MOSFET/IGBT based PWM inverter

Open Ended Experiments:

1. SCR digital triggering circuit for a single phase controlled rectifier and ac voltage regulator
2. Speed control of stepper motor

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

High Voltage Engineering (3:0:0) 3

(Professional Elective-I)

(Effective from the academic year 2024-25)

Course Code	**BEE505A**	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. To understand the conduction and breakdown mechanism in gases, liquid and solid dielectrics.
2. To know about the generation of high voltages and currents and their measurement.
3. To understand the various types of over voltages phenomena and protection methods.
4. To discuss non-destructive testing of materials and electric apparatus.
5. To discuss high-voltage testing of electrical equipment

Preamble: Key areas of High Voltage Engineering include Understanding and improving materials and systems that provide electrical insulation to prevent breakdowns and failures. Studying phenomena such as corona discharge, partial discharge, and electrical breakdown, which are critical for designing high voltage systems. Developing methods and equipment to accurately test and measure high voltage components to ensure they meet safety and performance standards. Implementing protective devices and systems to safeguard the high voltage infrastructure from faults, surges, and other anomalies

Module – 1

Introduction: Electric field stress, gas, liquid, solid and composite dielectrics.

Conduction and Breakdown in Gases: Gases as Insulating Media, Collision Process – types of collision, Mobility of ions and electrons. Ionization Processes- Ionization by collision. Townsend's Current Growth Equation--Current Growth in the Presence of primary and Secondary Processes, Townsend's Criterion for Breakdown, Breakdown in Electronegative Gases, Time Lags for Breakdown, Paschen's Law, Corona Discharges.

Conduction and Breakdown in Liquid Dielectrics: Breakdown in Liquid dielectrics. - Suspended particle, bubble and stressed oil volume mechanism.

Conduction and Breakdown in Solid Dielectrics: Intrinsic Breakdown, Electromechanical Breakdown, Thermal Breakdown. **8 hours**

Module – 2

Generation of High Direct Current Voltages: Voltage Doubler circuit, Voltage multiplier circuit-Cockcroft Walton circuit, Ripple and voltage drop in multiplier circuit. Vandegraaff generator.

Generation of High Alternating Voltages: Cascade transformers, Resonant transformers, Tesla coil.

Generation of Impulse Voltages and currents: Standard impulse wave, Circuit for producing impulse waves- Analysis of impulse generator RLC circuit, Wave shape control, Marx circuit, Generation of impulse current: standard impulse current wave, Circuit for producing impulse current wave. **8 hours**

Module – 3

Measurement of High DC Voltages and Currents: Measurement of High DC Voltages –Series Resistance micro ammeter, Resistance potential divider, Generating voltmeter.

Measurement of High AC voltages- Series impedance voltmeter, Series capacitance voltmeter,

Capacitance potential dividers, Capacitance voltage transformers. Electrostatic voltmeter, series capacitance peak voltmeter (chubb-Fortscue method), Spark gaps for measurement of High dc, ac and Impulse voltages - Spark gap measurements, Factors influencing the spark over voltage of sphere gaps.

Measurement of Impulse Voltages – Resistance potential dividers, capacitance voltage dividers, Mixed R-C potential dividers Peak reading voltmeters for impulse voltages.

Measurement of High DC, AC and impulse Currents - Hall generator, Resistive shunt, Rogowski coils and Magnetic links. **8 hours**

Module – 4

Natural Causes for Over voltages

Lightning phenomenon –Charge formation in the clouds, Mechanism of lightning strokes, Over voltages due to indirect stroke.

Power frequency Overvoltage – Sudden load rejection, Ferranti effect. Control of over voltages due to switching.

Protection of transmission lines against over voltages- Using shielded or ground wires, Ground rods and counter poise wires

Surge arresters -Protector tubes, Nonlinear element surge arrestor. **8 hours**

Module – 5

Non-Destructive Testing of Materials and Electrical Apparatus

Power frequency measurements- Schering bridge for audio frequency, transformer ratio arm bridge. Partial discharge measurements- straight discharge detection, Balance detection.

High Voltage Testing of Electrical Apparatus-Testing of insulators, bushings, circuit breakers, cables. **Testing of transformers-** Impulse test, Tests on surge arrestors.

8 hours

Course Outcomes:

The students will be able to:

CO1:	Explain conduction and breakdown phenomenon in gases, liquids and solid dielectrics.
CO2:	Design and simulate the generation of high voltages and currents
CO3:	Design and analyze the measurement techniques for high voltages and currents.
CO4:	Summarize overvoltage phenomenon and protection of electric power systems
CO5:	Discuss the non-destructive testing of materials and high-voltage testing of electric apparatus .

Textbooks:

1. High Voltage Engineering M.S. Naidu, V.Kamaraju McGraw Hill 5th Edition, 2013.
2. High Voltage Engineering Wadhwa C.L. New Age International 3rd Edition, 2012

References:

1. High Voltage Engineering Fundamentals, E. Kuffel, W.S. Zaengl, J. Kuffel, Newnes, 2nd Edition, 2000
2. High-Voltage Test and Measuring Techniques, Wolfgang Hauschild, Eberhard Lemke, Springer 1st Edition,2014.
3. High Voltage Engineering Farouk A.M. Rizk CRC Press 1st Edition2014
4. High-voltage Engineering : Theory and Practice, Abdel-Salam, Mazen; Anis, Hussein; El-Morshedy, Ahdab; Radwan, Roshdy , CRC Press, 2019.

Alternate Assessment Tools (AATs) suggested:

- Generation of high voltages and currents using any simulation software
- Measurement of Impulse voltages and Impulse currents using any simulation software.

Web links / e – resources:

1. https://digital-library.theiet.org/content/journals/hve
2. https://archive.nptel.ac.in/courses/108/104/108104048

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

FUNDAMENTALS of VLSI (3:0:0) 3

(Professional Elective- I)

(Effective from the academic year 2024-25)

Course Code	**BEE505B**	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. Appreciate the scope of microelectronic circuits in daily life.
2. Understand the MOS transistor operation in different modes.
3. Design and develop subsystems of various digital systems
4. Model the digital circuits using Verilog descriptions.

Preamble:

The microscopic dimensions of current silicon-integrated circuitry make possible the design of digital circuits which may be very complex and yet extremely economical in space, power requirements and cost, and potentially very fast. The space, power and cost aspects have made silicon the dominant fabrication technology for electronics in very wide-ranging areas of application. The combination of complexity and speed is finding ready applications for VLSI systems in digital processing, and particularly in those application areas requiring sophisticated high speed digital processing. Global VLSI Semiconductor Market size was valued at USD 57.22 Bn. in 2023 and the total VLSI Semiconductor revenue is expected to grow by 6.1% from 2024 to 2030, reaching nearly USD 86.61 Bn

Module – 1

Introduction to MOS Technology

Introduction to IC technology, MOS and related VLSI technology, basic MOS transistors, enhancement and depletion mode transistor action, n-MOS fabrication, CMOS fabrication: p-well, n-well, twin-tub process, production of e-beam masks

Basic Electrical Properties of CMOS: Ids versus Vds characteristics, n-MOS inverter, alternative forms of pull-up. **8 Hours**

Module – 2

CMOS Inverter

CMOS inverter, MOS transistor circuit model, Latch-up in CMOS circuits

MOS Circuit Design Process

MOS Layers, Stick Diagrams: nMOS and CMOS design style, Design rules and layout, λ-based design rules, Layout diagrams, symbolic diagrams

8 Hours

Module – 3

Subsystem Design and Layout

Architectural issues, switch logic-Two input n-MOS, cMOS NAND and NOR Gate Logic, examples of structured design- Parity Generator, Multiplexers, General Logic Function Block.

8 Hours

Module – 4

Introduction to Verilog: Structure of Verilog module, Operators, Data Types, Styles of Description. (Section 1.1 to 1.6.2, 1.6.4 (only Verilog), 2 of Text 2)

Verilog Data flow description: Highlights of Data flow description, Structure of Data flow

description. (Section 2.1 to 2.2 (only Verilog) of Text 2)

8 Hours

Module – 5

Verilog Behavioral description: Structure, Variable Assignment Statement, Sequential Statements, Loop Statements, Verilog Behavioral Description of Multiplexers (2:1, 4:1, 8:1). (Section 3.1 to 3.4 (only Verilog) of Text 2)

Verilog Structural description: Highlights of Structural description, Organization of structural description, Structural description of ripple carry adder. (Section 4.1 to 4.2 of Text 2)

8 Hours

Course Outcomes:

The students will be able to:

CO1:	Illustrate the fabrication process and basic operation of MOS transistors in various modes and configurations
CO2:	Describe the structure, operators, data types and styles of Verilog description.
CO3:	Apply the design process and develop the MOS digital circuits and subsystems
CO4:	Model basic digital circuits using Verilog descriptions.

Textbooks:

1. Basic VLSI Design, Douglas Pucknell and Eshragian, PHI, 3rd Edition, 2009
2. HDL Programming VHDL and Verilog by Nazeih M Botros, 2009 reprint, Dreamtech press

References:

1. Modern VLSI Design, Wayne Wolf, Pearson Education Inc. 3rd Edition, 2003.
2. Introduction to CMOS VLSI Design – A Circuits and Systems Perspective, Neil Weste, Pearson Education, 3rd Edition
3. Fundamentals of HDL, by Cyril P R, Pearson/Sanguine 2010
4. Digital Principles and Design by Donald D Givone, McGraw Hill, 2002.

Alternate Assessment Tools (AATs) suggested:

- Design a 4:1 Multiplexer using NAND Gates and draw Stick Diagram.
- Design a Full Adder using Verilog description of all three styles.

Web links / e – resources:

1. **https://vlsiresources.com**
2. **https://nptel.ac.in/courses/117106092**

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

SENSORS AND TRANSDUCERS(3:0:0) 3

(Professional Elective-I)

(Effective from the academic year 2024-25)

Course Code	**BEE505C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:1	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Understand the needs of transducers, their classification, advantages and disadvantages.
2. Explain the working of different types of transducers and sensors.
3. Understand the basics of signal conditioning and signal conditioning equipment.
4. Understand the basics of Data transmission and telemetry.
5. Discuss measurement of various non-electrical quantities

Preamble:

This course is designed with an aim to make students familiar with the working principle of different types of sensors and transducers. The Global Sensor Market size was valued at $166.69 billion in 2019 and is projected to reach $345.77 billion by 2028, to register a CAGR of 8.9% from 2021 to 2028.

Module – 1

Introduction to Sensors and Transducers: Classification of Transducers, Advantages and Disadvantages of Electrical Transducers, Transducers Actuating Mechanisms, Resistance Transducers, Variable Inductance Transducers, Capacitive Transducers, Piezoelectric Tr ansducers, Hall Effect Transducers, Thermoelectric Transducers, Photoelectric Transducers. **8 Hours**

Module – 2

Sensors and Transducers (continued): Strain Gages, Load Cells, Proximity Sensors, Pn eumatic Sensors, Light Sensors, Tactile Sensors, Fiber Optic Transducers, Digital transducers, Recent

Trends– Smart Pressure Transmitters, Selection of Sensors, Rotary – Variable Differenti al Transformer, Synchros and Resolvers, Induction Potentiometers, Micro Electromechanical Systems. **8 Hours**

Module – 3

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

Introduction, Objectives and Configuration of Data Acquisition System, Data Acquisition Systems, Data Conversion. **8 Hours**

Module – 4

Data Transmission and Telemetry: Data/Signal Transmission, Telemetry. Measurement of Non – Electrical Quantities: Pressure Measurement, Temperature Measurement.

8 Hours

Module – 5

Measurement of Non – Electrical Quantities (continued): Flow Measurement –

Introduction, Electromagnetic Flow meters, Ultrasonic Flow Meters, Thermal Metes, 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. **8 Hours**

Course Outcomes:
The students will be able to:

CO1: Classify, analyse and select transducers for different applications
CO2: Analyse the signal conditioning, data acquisition, data transmission and telemetry systems
CO3: Analyze, select transducers for the measurement of various non-electrical quantities.

Textbooks:

1. R.K Rajput S. Chand, "Electrical and Electronic Measurements and instrumentation", 3rd Edition, 2013
2. J.B. Gupta, "A Course in Electronics and Electrical Measurements and Instruments, Katson Books, 13th Edition, 2008

References:

1. H S Kalsi, Electronic Instrumentation, Mc Graw Hill Publishers, Third Edition, 2017
2. A. K. Sawheny Dhanpat Rai, A Course in Electrical and Electronic Measurements and Instrumentation, 2015
3. D V S Murty, Transducers and Instrumentation, PHI Publishers, 2nd Edition,, 2008
4. D Patranabis, Sensors and Transducers, PHI Publishers, 2nd Edition, 2003

Alternate Assessment Tools (AATs) suggested:

- Analyse different types of transducers as per the principle of operation.
- Analyse various types of transducers used for measurement of non-electrical quantities.

Web links / e – resources:

1. https://www.sensorsportal.com/HTML/Sensor.html
2. https://onlinecourses.nptel.ac.in/noc23_ee105/preview
3. https://aerospace.honeywell.com/

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

Special Electrical Machines(3:0:0) 3

(Professional Elective- I)

(Effective from the academic year 2024-25)

Course Code	**BEE505D**	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 working principles, construction, operation, characteristics and applications of various types of stepper motors,switched reluctance motor and DC Motors
2. Explain the operation, characteristics and applications of various types of synchronous motors
3. Discuss applications of various types of single phase special electric machines and servo motors
4. Analyse the characteristics and applications of various types of Linear, Axial flux and Radial flux electric machines.

Preamble: Special electrical machines are finding ever-increasing applications, typically in position control systems, robotics and mechatronics, electric vehicles and high speed transportation. The global electric motor market size was valued at USD 128.35 billion in 2023 and is projected to grow from USD 137.12 billion in 2024 to USD 246.59 billion by 2032, exhibiting a CAGR of 7.61% during the forecast period.

Module – 1

Introduction to special electrical machines - 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.

Stepper Motor: Introduction, Variable Reluctance Stepper Motor, Permanent Magnet S tepper Motor, Hybrid Stepper Motor, Other Types of Stepper Motor, Windings in Stepper Motors, Torque equation, Characteristics of Stepper Motor, Microprocessor – Based Control of Stepper Motor, Applications of Stepper motor. **8 Hours**

Module – 2

Switched Reluctance Motor (SRM): Construction, Principle of Working, Torque Equation and Characteristics, Power Converter Circuits, Control of SRM, Rotor Position Sensors, Microprocessor – Based Control of SRM, Sensor less Control of SRM. **8 Hours**

Module – 3

Permanent Magnet DC Motor and Brushless Permanent Magnet DC Motor: Permanent Magnet DC (PMDC) motor, Brushless Permanent Magnet DC (BLDC) Motors.

Permanent Magnet Synchronous Motor (PMSM): Construction, Principle of Operatio n, Torque Equation, Comparison of Conventional and PMSM, Control of PMSM, Applications. **8 Hours**

Module – 4

Synchronous Reluctance Motor (SyRM): Constructional of SyRM, Working, Torque

Equation, Control of SyRM, Advantages and Applications.
Single Phase Special Electrical Machines: AC series Motor, Single Phase Reluctance Motor, Universal Motor. **8 Hours**

Module – 5

Servo Motors: DC Servo Motors, AC Servo Motors.
Linear Electric Machines: Linear Induction Motor, Linear Synchronous Motor, DC Lin ear Motor, Linear Reluctance Motor, Linear Levitation Machines. **8 Hours**

Course Outcomes:
The students will be able to:

CO1:	Develop mathematical models for Stepper motors, Switched Reluctance Motor controllers.
CO2:	Apply basic principles to model the PMDC, BLDC Motors.
CO3:	Analyse and differentiate PMSM, SyRM and single phase special motors.
CO4:	Analyse the servo motors and linear permanent magnet machines.

Textbooks:

1. E.G. Janardanan , Special Electrical Machines, PHI, 1st Edition 2014
2. K Venkataratham, Special Electrical Machines, University Press, 2009

References:

1. T J E Miller Clerendon, "Brushless Permanent Magnet and Reluctance Motor Drives", Oxford Press, 1989
2. Kenjo T and Nagamori S Clerendon, "Permanent Magnet and Brushless DC Motors", Oxford Press, 1985
3. KenjoTClerendon, "Stepping Motors and their Microprocessor Control", Press Oxford, 1984
4. Krishan R, "Switched Reluctance Motor Drives Modeling, Simulation Design and Applications", CRC, 2001

Alternate Assessment Tools (AATs) suggested:

- Analyse the characteristics operation and characteristics of stepper motor and switched reluctance motor.
- Analyse the characteristics operation and characteristics of PMDC motor and synchronous reluctance motor.

Web links / e – resources:

1. https://archive.nptel.ac.in/courses/108/102/108102146/
2. https://www.mdpi.com/journal/machines/special_issues/388U663WBR

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

RESEARCH METHODOLOGY AND IPR (2:0:0)2

Common to all Branches

(Effective from the academic year 2024-25 for 2022 Scheme)

Course Code	**BRMK507**	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:0	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	03

Course Objectives:

This course will enable students to:

1. Explain research process and research problem.
2. Gain knowledge on research design, sampling survey and data collection.
3. Familiarized with Interpretation and report writing.
4. Understand the concept of IP, patent and copyright.
5. Enhance their knowledge on trademarks, industrial and IC layout design.

Module – 1

Research Methodology: Meaning of Research, Objectives of research, types of research, research approaches, Significance of research, Research Process: Formulating research problem, Research methods versus methodology, Research and scientific method. Criteria of good research.

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

(06 Hours)

Module – 2

Research Design: Meaning of Research Design, Need for Research design, Feature of a Good Design. Research Design in case of exploratory research studies, descriptive and diagnostic research studies. Basic Principles of Experimental Designs.

Design of sampling survey: Sample Design: Objective, size of sample, parameter of interest, selection of proper sample design. Sampling errors, non-sampling errors.

Data Collection: Experiments and Surveys, collection of primary data: observation method. Collection of secondary data. Selection of appropriate methods for data collection.

(05 Hours)

Module – 3

Interpretation and Report writing: Meaning of Interpretation, Techniques of Interpretation, Precautions in interpretation, Significance of report writing, Different steps in report writing, layout of the research report, Types of reports, Oral presentation, Mechanics of writing research report, Precautions for writing research reports.

(05 Hours)

Module – 4

Introduction to IP: Various forms of IP, Importance of intellectual property, Trade policy reviews, Agreement on trips.

Patent: What is patent, condition for grant of patent, Temporal and spatial aspects of patent,

right of patentee, Patent office and register of patent.

Copyright: Copyright and classes of work, meaning of publication, ownership of copyright, license of copyright, term of copyright, Internet and copyright issues.

(05 Hours)

Module – 5

Trademarks: Introduction to trademark, term of trademark, collective marks, certification trademarks.

Industrial Design: Registration of Design: Non-registrable designs under The Design Act 2000, Condition for registration of Industrial Designs. Term of Industrial Designs.

IC Layout Design: Integrated Circuits Layout Design, Grant of registration of IC Layout Design.

(05 Hours)

Course Outcomes:

The students will be able to:

CO1: Illustrate research process and research problem.
CO2: Describe research design, sampling survey and data collection.
CO3: Explain the techniques of Interpretation and report writing.
CO4: Summarize the concept of IP, patent and copyright.
CO5: Discuss trademarks, industrial and IC layout design.

TEXTBOOKS:

1. CR Kothari and Gaurav Garg, Research Methodology, New Age International Publishers, 2020.
2. Neeraj Pandey, Khushdeep Dharni, "Intellectual Property Rights", PHI Learning, 2014.

REFERENCES:

1. Dinakar Deb, rajdeep Dey, Valentina, Engineering Research Methodology, Springer, 2019.
2. David V. Thiel, Research method for engineers, Cambridge University Press, 2014.
3. Prabhuddha Ganguli, "Intellectual Property Rights", Tata Mc-Graw –Hill, 2017.

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

Environmental Studies (1:0:0) 1

Common to all Branches

(Effective from the academic year 2024-25 for 2022 Scheme)

Course Code	BESK508	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Total Number of Lecture Hours	15	Exam Hours	01

CREDITS: 01

Course objectives:

This course will enable students to

1. Recognize the ecological basis for regional and global Environmental issues, and lead by example as an environmental steward.
2. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
3. Analyze the trans-national character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as environmentalists.

Module – 1

Biodiversity: Types, Value, Hot spots and Threats.

*Field work: Visit to a local area to document environmental assets: River / Forest / Grassland / Hill

(3 Hours)

Module – 2

Environmental Pollution & Abatement & Relevant Acts: Water, Soil and Air Pollution.

(3 Hours)

*Field work: Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural, followed by observation and documentation of environmental pollution and recommendation of remedial measures.

Module – 3

Waste Management & Public Health Aspects & Relevant Acts: E-waste, Bio-medical & Hazardous wastes. (3 Hours)

*Field work: Visit to a Resource Management Facility or Waste Treatment Facility, followed by understanding of process and its brief documentation.

Module – 4

Global Environmental Concerns: Ground water depletion, Climate Change and Carbon Trading.

(3 Hours)

*Field work: Visit to a Green Building, followed by understanding of process and its brief documentation.

Module – 5

Latest Developments in Environmental Pollution Mitigation: E.I.A., E.M.S., SDG.

(3 Hours)
*Field work: Visit to Environmental NGOs, followed by brief documentation.
Self-Study/Discussion on Case Studies: Environmental Stewardship

* Any one Field Work is to be successfully accomplished. The same will be assessed for AAT.

Course outcomes:
The students will be able to:

CO1: Appraise the significance of ecological systems under the ambit of environment.
CO2: Analyze for the consequences owing from anthropogenic interactions on the environmental processes.
CO3: Recommend solutions in the Anthropocene Epoch, with an in-depth understanding of the interdisciplinary facets of environmental issues.
CO4: Elucidate the trans-national character of environmental problems and ways of addressing them.
CO5: Appraise latest developments, concerns and ethical challenges associated with Environmental Protection.

Text Book:

1. Rajesh Gopinath and N. Balasubramanya, "Environmental science and Engineering", 1st Edition, Cengage Learning India Private Limited, 2018.
2. J. S. Singh, S. P. Singh and S. R. Gupta, "Ecology, Environmental Science and Conservation", India, S. Chand Publishing, 2017.

References:

1. M. Gadgil and R. Guha, "This Fissured Land: An Ecological History of India", Univ. of California Press, 1993.
2. E. P. Odum and H. T. Odum, "Fundamentals of Ecology", Philadelphia: Saunders Publisher, 1971.
3. M. L. Mckinney, "Environmental Science systems & Solutions", Web enhanced Edition, City of Publisher, R. M. Publisher, 1996.

ASSESSMENT METHODS:

CIE Components (50 Marks)
The pattern of the CIE question paper is MCQ.
Two Unit Tests each of 40 Marks, MCQ type (duration 01 hour). Average of the two Internal Assessments Tests Marks will be out of 40 Marks, which is further scaled down to 25 Marks. (Student should score a minimum of 10 marks to be eligible.)

Two Assignment / AATs : 25 Marks [each]
Sum of the Assignment and AATs will be out of 50 Marks and scaled down to 25 Marks. (Student should score a minimum of 10 marks to be eligible.)

Internal Assessments Tests : 25 Marks
Assignment and AAT : 25 Marks

Total CIE Marks : 50 Marks (Student should score a minimum of 20 marks to be eligible.)

SEE Components (50 Marks)

- The pattern of the SEE question paper is MCQ.
- SEE question paper will be set for 50 questions of each of 01 marks. (Student should score a minimum of 20 marks to be eligible.)

Assessment Details (both CIE and SEE):

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 100%.
- 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 course if the student 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.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER – V

National Service Scheme (NSS)

(Common to all branches, Effective from the academic year 2024-25)

Course Code	**BNSK509**	CIE Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of degree)

Course Objectives: National Service Scheme (NSS) will enable the students to:

1. Understand the community in general in which they work.
2. Identify the needs and problems of the community and involve them in problem solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Module – 1

Introduction to NSS:

History and growth of NSS, Philosophy of NSS, Objectives of NSS, Meaning of NSS Logo, NSS Programs and activities, administrative structure of NSS, Planning of programs / activities, implementation of NSS programs / activities, National & State Awards for NSS College / Program Officer / Volunteers.

(04 Hours)

Module – 2

Overview of NSS Programs

Objectives, special camping – Environment enrichment and conservation, Health, Family, Welfare and Nutrition program. Awareness for improvement of the status of women, Social Service program, production-oriented programs, Relief & Rehabilitation work during natural calamities, education and recreations, Selection of the problem to be addressed.

(**04 Hours)**

Module – 3

NSS Activities - Group Contributions to Society / community (Activity based Learning):

Organic Farming, Indian agriculture (Past, Present, Future) Connectivity for marketing, Waste management– Public, Private and Govt. organization, 5 R's. Water conservation techniques – role of different stakeholders – implementation, preparing an actionable business proposal for enhancing the village income and approach for implementation. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.

(06 Hours)

Module – 4

NSS National Level Activities for Society / Community at large (Activity based Learning):

Developing Sustainable Water management system for rural areas and implementation approaches. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc. **(06 Hours)**

Module – 5

NSS Individual Activities for Local Voice (Activity based learning)

Govt. school Rejuvenation and helping them to achieve good infrastructure, Plantation and adoption of plants. Know your plants. Spreading public awareness under rural outreach programs, National integration and social harmony events.

(06 Hours)

Course outcomes (Course Skill Set):

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

CO1: Understand the importance of his / her responsibilities towards society.

CO2: Analyse the environmental and societal problems/issues and will be able to design solutions for the same.

CO3: Evaluate the existing system and to propose practical solutions for the same for sustainable development.

CO4: Implement government or self-driven projects effectively in the field.

CO5: Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Assessment Details

Weightage	**CIE – 100%**
Presentation -1 Selection of topic, PHASE-1	20 Marks
Commencement of activity and its progress – PHASE – 2	20 Marks
Case Study based Assessment – Individual performance	20 Marks
Sector wise study and its consolidation	20 Marks
Video based seminar for 10 minutes by each student at the end of the course with Report	20 Marks

Suggested Learning Resources:

Books:

1. NSS Course Manual**,** Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER - V

Physical Education (Sports and Athletics)

(Common to all branches, Effective from the academic year 2024-25)

Course Code	**BPEK509**	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	--
Total Number of Contact Hours	26	Exam Hours	--

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of degree)

Course Objectives: The course will enable students to

1. Develop a healthy life style.
2. Acquire Knowledge about various stages of sports and games.
3. Focus on modern technology in sports.

Module – 1

Introduction of the game: Aim of sports and games, Brief history of the game, Nature of the game, Terminology & Modern trends of the game, Fitness & Skill tests along with Game Performance.

(06 Hours)

Module – 2

Offensive and Defensive Techno Tactical Abilities: Fitness, Fundamentals & Techniques of the game with the implementation of Biomechanics, Tactics- Drills for the Techno Tactical abilities, Individual and Group, Miner games- to implement the Techniques, Tactics and Motor abilities.

(05 Hours)

Module – 3

Team tactics and Rules of the Game: Rules and Regulations of the Game: Game rules as well as sequence of officiating, Team tactics: Offensive and Defensive team strategies and scrimmages, Practice Matches: among the group, Analysis of Techno Tactical abilities: Correction and implementation of skills and Sports Injuries and rehabilitation: First aid, PRICE treatment,

(05 Hours)

Module – 4

Sports Training: Introduction of Sports Training, Principles of Sports performance, how to increase and sustain the sports performance, Training Load & Recovery- How to increase the training load (volume/Intensity) and means and methods for Recovery, Periodization: Shorts, Medium and Long term, Physiological changes: Changes in Lung capacity, heart beats etc.

(05 Hours)

Module – 5

Organization of Sports Event: Tournament system, Planning and preparation for the competition, Ground preparation and Equipment's, Organizing an event among the group.

(05 Hours)

The above 5 modules are common to all the sports events / games, we are offering the following games**: 1. Baseball, 2. Kabaddi, 3. Table Tennis, and 4. Volleyball.**

Course outcomes:

The students will be able to:

1. Understand the importance of sports and games, inculcate healthy habits of daily exercise & fitness, Self-hygiene, good food habits, Create awareness of Self-assessment of fitness.
2. Develops individual and group techno tactical abilities of the game.
3. Increases the team combination and plan the strategies to play against opponents.
4. Outline the concept of sports training and how to adopt technology to attain high level performance.
5. Summarize the basic principles of organising sports events and concept of technology implemented to organise competitions in an unbiased manner.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation and video analysing.
- Practical classes in outdoor and indoor as per requirement.

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.
- CIE 2 for 60 marks – A practical test conducted at the end of the semester in which the student has to give fitness and skill tests and his performance in game will be assessed.

Textbooks:

1. Barbara Bushman, "ACSM's complete guide to Fitness & Health", 2011, Human Kinetics USA
2. Pankaj Vinayak Pathak, **"*Sports and Games - Rules and Regulation*", 2019, Khel Sahitya Kendra.**
3. Hardayal Singh, *"Sports Training, General Theory & Methods"***,** 1984 "Netaji Subhas, National Institute of Sports".
4. Keith A. Brown, "International Handbook of Physical Education and Sports Science", 2018, (5 Volumes) Hardcover.

References:

1. Tudor O Bompa,*" Periodization Training for Sports*", 1999, Human Kinetics, USA
2. Michael Boyle, "New Functional Training for Sports" 2016, Human Kinetics USA
3. Michael Kjaer, Michael Rogsgaard, Peter Magnusson, Lars Engebretsen & 3 more, "Text book of Sports Medicine: Basic Science and Clinical Aspects of Sports Injury and Physical Activity", 2002, Wiley Blackwell.
4. Scott L. Delp and Thomas K. Uchida, "Biomechanics of Movement: The Science of Sports, Robotics, and Rehabilitation", 2021, The MIT Press
5. MCARDLE W.D. "Exercise Physiology Nutrition Energy And Human Performance" 2015, LWW IE (50)

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER - V

Yoga

(Common to all branches, Effective from the academic year 2024-25)

Course Code	**BYOK509**	CIE Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Course Objectives:

This course will enable students to:

1. Understand the importance of practicing yoga in day-to-day life.
2. Be aware of therapeutic and preventive value of Yoga.
3. Have a focussed, joyful and peaceful life.
4. Maintain physical, mental and spiritual fitness.
5. Develop self-confidence to take up initiatives in their lives.

Module – 1

Introduction to Yoga: Introduction, classical and scientific aspects of yoga, Importance, Types, Healthy Lifestyle, Food Habits, Brief Rules, Sithalikarana Practical classes.

(04 Hours)

Module – 2

Physical Health: Introduction, Pre-requisites, Asana-Standing, Sitting, Supine and Prone, Practical classes.

(06 Hours)

Module – 3

Psychological Health: Introduction Thought Forms, Kriya (Kapalabhati), Preparation to Meditation, Practical classes.

(06 Hours)

Module – 4

Therapeutic Yoga: Mudra Forms, Acupressure therapy, Relaxation techniques Practical classes.

(06 Hours)

Module – 5

Spirituality & Universal Mantra: Introduction, Being Human, Universal Mantra, Universal LOVE, Benefits of practice of Spirituality in day-to-day life, practical classes.

(04 Hours)

Course Outcomes:

Students will be able to:

1. Understand the requirement of practicing yoga in their day-to-day life.
2. Apply the yogic postures in therapy of psychosomatic diseases
3. Train themselves to have a focussed, joyful and peaceful life.
4. Demonstrate the fitness of Physical, Mental and Spiritual practices.
5. Develops self-confidence to take up initiatives in their lives.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.
- CIE 2 for 60 marks – A practical test conducted at the end of the semester in which the student have to perform asanas.

Textbooks

1. George Feuerstein: The yoga Tradition (Its history, literature, philosophy and practice.)
2. Sri Ananda: The complete Book of yoga Harmony of Body and Mind. (Orient paper Backs: vision Books Pvt.Ltd., 1982.
3. B.K.S Iyenkar: Light on the Yoga sutras of patanjali (Haper Collins Publications India Pvt.,Ltd., New Delhi.)
4. Science of Divinity and Realization of Self – Vethathiri Publication, (6-11) WCSC, Erode

References

1. Principles and Practice of Yoga in Health Care, Publisher: Handspring Publishing Limited, ISBN: 9781909141209, 9781909141209
2. Basavaraddi I V: Yoga in School Health, MDNIY New Delhi, 2009
3. Dr. HR. Nagendra: Yoga Research and applications (Vivekanda Kendra Yoga Prakashana Bangalore)
4. Dr. Shirley Telles: Glimpses of Human Body (Vivekanda Kendra Yoga Prakashana Bangalore)

Web resources

Web links and Video Lectures (e-Resources): Refer links
1. https://youtu.be/KB-TYlgd1wE
2. https://youtu.be/aa-TG0Wg1Ls

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER - V

National Cadet Course (NCC)

(Common to all branches, Effective from the academic year 2024-25)

Course Code	**BNCK509**	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of degree)

Course Objectives:

This course will enable students to:

- Understand the vision of NCC and its functioning.
- Understand the security set up and management of Border/Coastal areas.
- Acquire knowledge about the Armed forces and general awareness.

Module– 1

Introduction to National Cadet Corp: What is NCC, who can join NCC, benefits, Establishment, history, 3 wings, motto, core values, Aims, flag, song, pledge, cardinals, Organization, Director General NCC, Directorates, Uniform and Cadet ranks, Camps, Certificate exams, Basic aspects of drill.

National Integration: Importance of national integration**,** Factors affecting national integration, Unity in diversity**,** Role of NCC in nation building.

Disaster Management: What is a Disaster**,** Natural and Man-made disasters**,** Earthquake, Floods. **(04 Hours)**

Module– 2

Indian Army:

Introduction to Indian Army, Command and control, Fighting & supporting arms**,** Rank structure, Major Regiments of the Army**,** Major Wars and Battles**,** Entry to the Indian Army, Renowned leaders and Gallantry Awardees. **(02 Hours)**

Module– 3

Indian Air Force: Introduction to Indian Air Force, Command and control**,** Rank structure**,** Major Aircrafts, Entry to the Indian Air Force, Renowned leaders.

Indian Navy: Introduction to Indian Navy, Command and control, Rank structure, Major Ships and Submarines**,** Entry to the Indian Navy, Renowned leaders. **(02 Hours)**

Module– 4

Health and Hygiene: First Aid Protocols - CPR, Understanding Types of Bandages, Fire Fighting

Field & Battle Crafts: Field Signals using hands, Judging distance -Types of Judging Distance, Section formations-types of Section Formation. **(10 Hours)**

Module– 5

Drill Practicals: Savdhan, Vishram, Salute, Turning, Marching.

(8 hours)

Course outcomes:

The students will be able to:

CO1: Develop qualities like character, comradeship, discipline, leadership, secular outlook, spirit of adventure, ethics and ideals of selfless service.

CO2: Get motivated and trained to exhibit leadership qualities in all walks of life and be always available for the service of the nation.

CO3: Familiarize on the issues related to social & community development and disaster management and equip themselves to provide solutions.

CO4: Get an insight of the defense forces and further motivate them to join the defense forces.

Teaching Practice:

- Blackboard/Multimedia Assisted Teaching.
- Class Room Discussions, Brainstorming Sessions, Debates.
- Activity: Organizing/Participation in Social Service Programs.

On Ground: Drill training.

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.

CIE 2 for 60 marks – A practical test conducted at the end of the semester.

Textbooks:

1. NCC Cadets Handbook –Common Directorate General of NCC, New Delhi.
2. NCC Cadets Handbook –Special(A), Directorate General of NCC, New Delhi.

References:

- Chandra B. Khanduri, “Field Marshal KM Cariappa: a biographical sketch”, Dev Publications,2000.

Gautam Sharma, “Valour and Sacrifice: Famous Regiments of the Indian Army”, Allied Publishers,1990.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS) applicable for 2022 Scheme

SEMESTER - V

Music

(Common to all branches, Effective from the academic year 2024-25)

Course Code	**BMUK509**	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of the Degree)

Course Objectives:

The course will enable the students to:

1. Identify the major traditions of Indian music, both through notations and aurally.
2. Analyze the compositions with respect to musical and lyrical content.
3. Demonstrate an ability to use music technology appropriately in a variety of settings.

Module – 1

Preamble: Contents of the curriculum intend to promote music as a language to develop an analytical, creative, and intuitive understanding. For this the student must experience music through study and direct participation in improvisation and composition.

Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela. **(03 Hours)**

Module – 2

Compositions: Introduction to the types of compositions in Carnatic Music - Geethe, Jathi Swara, Swarajathi, Varna, Krithi, and Thillana, Notation system.

(03 Hours)

Module – 3

Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysore Vasudevacharya. **(03 Hours)**

Module – 4

Music Instruments: Classification and construction of string instruments, wind instruments, percussion instruments, Idiophones (Ghana Vaadya), Examples of each class of Instruments

(03 Hours)

Module – 5

Abhyasa Gana: Singing the swara exercises (Sarale Varase Only), Notation writing for Sarale Varase and Suladi Saptha Tala (Only in Mayamalavagowla Raga), Singing 4 Geethe in Malahari, and one Jathi Swara, One Nottu Swara OR One krithi in a Mela raga, a patriotic song

(14 Hours)

Course Outcomes (COs):

The students will be able to:

CO1: Discuss the Indian system of music and relate it to other genres (Cognitive Domain)

CO2: Experience the emotions of the composer and develop empathy (Affective Domain)

CO3: Respond to queries on various patterns in a composition (Psycho-Motor Domain)

Teaching Practice:

- Classroom teaching
- ICT – PowerPoint Presentation
- Audio & Video Visualization Tools

CIE: 100 Marks

- **CIE 1** for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester
- **CIE 2** for 60 marks – A practical test conducted at the end of the semester in which the student has to recite one Sarale Varase mentioned by the examiner in three speeds. Sing / Play the Geethe in Malahari. Singing / Playing Jathi Swara / Krithi.

Textbooks

1. Vidushi Vasantha Madhavi, "Theory of Music", Prism Publication, 2007.
2. T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana
   - Vol. 1 (English), Shreenivaasa Prakaashana, 2018.

References

1. Lakshminarayana Subramaniam, Viji Subramaniam, "Classical Music of India: A Practical Guide", Tranquebar 2018.
2. R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci
   a. Charitable Trust; Third edition, 2019.
3. Ethel Rosenthal, "The Story of Indian Music and Its Instruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.
4. Carnatic Music, National Institute of Open Schooling, 2019.