BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Avalahalli, Yelahanka, Bengaluru 560064

Bachelor of Engineering

Department of Electronics and Communication Engineering

V Semester Scheme and Syllabus
2022 Scheme – Autonomous
AY 2024-2025

Approved in the BoS meeting held on 20.07.2024

Vision and Mission of the Department

Vision

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

Mission

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

2. Promote Interdisciplinary Research

3. Inculcate Professional Ethics

Program Educational Objectives (PEOs)

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

Program Specific Outcomes (PSOs)

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

Program Outcomes (POs)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.

4. **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.
5. **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
6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.
12. **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.

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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 Electronics & Communication Engineering

Scheme of Teaching and Examinations – 2022 Scheme AY 2024-2025

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

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	BEC501	Management and Entrepreneurship	TD: ECE PSB: ECE	3	0	0	3	50	50	100	3	3
2	IPCC	BEC502	Digital Signal Processing		3	0	1	4	50	50	100	3	5
3	PCC	BEC503	ARM Processor		4	0	0	4	50	50	100	3	4
4	PCCL	BECL504	ARM Processor lab		0	0	1	1	50	50	100	3	2
5	PEC	BEC505X	Professional Elective Course I		3	0	0	3	50	50	100	3	3
6	PW	BEC506	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	BNSK559	National Service Scheme (NSS)	NSS Coordinator	0	0	0	0	100	-	100	-	2
		BPEK559	Physical Education (Sports and Athletics)	PED									
		BYOK559	Yoga	Yoga Teacher									
		BNCK559	National Cadet Corps (NCC)	NCC officer									
		BMUK559	Music	Music Teacher									
TOTAL					16	0	5	21	500	400	900	-	28

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**
BEC505A	Linear Integrated Circuits	BEC505D	System Verilog
BEC505B	Electronics Devices	BEC505E	Biomedical Sigal Processing
BEC505C	OOPS with C++		

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. ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Management and Entrepreneurship (3:0:0) 3

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BEC501**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

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

Preamble:

This course outlines key concepts such as leadership, innovation, risk-taking, and organizational development, setting the stage for understanding how businesses are managed and how entrepreneurs operate within the business landscape.

Module – 1

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

Planning: Importance, Types, Steps and Limitations of Planning; Decision Making types and Steps in Decision Making. **(**8 Hours)

Module – 2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management, Departmentalization.
Committees: Meaning, Types of Committees; Centralization Vs Decentralization of Authority, Responsibility. Staffing: Importance, Recruitment and Selection Process.

Directing and Controlling: Meaning and Requirements of Effective Direction.
Motivation: Nature of Motivation, **Motivation Theories** (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory). **Communication:** Meaning, Importance and Purposes of Communication. **Leadership:** Meaning, Characteristics, Behavioural Approach of Leadership. **Coordination:** Meaning, Types, Techniques of Coordination;

Controlling: Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, and Steps in Control Process. (8 Hours)

Module – 3

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship. Theories of Entrepreneurship. (8 Hours)

Module – 4

Entrepreneurial Project Development: Idea Generation and Feasibility Analysis- Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.
(Case study/Activity to demonstrate entrepreneurial abilities) (8 Hours)

Module – 5

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

Self-study topics:

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

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

(8 Hours)

Course outcomes:

The students will be able to:

CO1	Comprehend the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business.
CO2	Categorise the functions of Managers, Entrepreneurs and their social responsibilities of business.
CO3	Analyse the Concepts of Entrepreneurship to identify Business opportunities.
CO4	Identify the various types of supporting agencies and financing available for an entrepreneur to start a business plan.

Textbooks:

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

References:

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

and Leadership perspective", 10th Edition, McGraw Hill Education, 2016.

Continuous Comprehensive Assessments (CCA's) suggested:

Role play in a team which emphases on the functions of management. Preparation of Business plan and presenting the plan in a team.

Web links/e-resources:

https://archive.nptel.ac.in/courses/127/105/127105007/
https://archive.nptel.ac.in/courses/110/107/110107094/

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Digital Signal Processing (3:0:1) 4

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BEC502**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:1	SEE Marks	50
Total Number of Contact Hours	40 Theory+8-10 lab	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand the need for and importance of mathematical tools such as discrete Fourier Transforms (DFT) and Fast Fourier Transform (FFT) to analyze the signal.
2. Apply DFT properties on various signals.
3. Use FFT algorithms to eliminate redundant calculation and enable to analysis of the spectral properties of a signal.
4. Design analog and digital filters
5. Realize IIR and FIR filters using direct forms, cascade and parallel forms

Preamble:

Digital signal processing is continuation of Basic signal processing of 4th semester which starts with DFT and its properties, Decimation in time FFTs. The foundations of digital filter (design of IIR and FIR filter) design and realization are built up. Practice Problems with solutions with applications of DSP.

Module – 1

Introduction: Introduction to DSP systems, Discrete Fourier Transforms (DFT): Frequency domain sampling and Reconstruction of Discrete Time Signals, The Discrete Fourier Transform Properties of the DFT: Periodicity, Linearity, shifting property, reversal, Parsvels theorem, Correlation ,Symmetry properties (statements only) and Circular Convolution. (9 Hours)

Module – 2

Linear filtering methods based on the DFT: Use of DFT in Linear Filtering, Filtering of Long Data Sequences.

Fast-Fourier-Transform (FFT) algorithms: Efficient Computation of the DFT: Radix-2 FFT algorithms for the computation of DFT and IDFT–decimation-in-time. (7 Hours)

Module – 3

IIR Filter Design: Analog Butterworth Filters, Frequency transformation in Analog domain, Analog Filters using Lowpass prototype transformation. Design of IIR Digital Filters from Analog Filter: Bilinear Transformation and Frequency Warping, Bilinear Transformation Design Procedure, Digital Butterworth Filter Design using BLT. (8 Hours)

Module – 4

Design of FIR Filters: Characteristics features of FIR filter, Symmetric and Antisymmetric FIR filters, Design of Linear-phase FIR filters using windows - Rectangular, Hamming and Hanning, (7 Hours)

Module – 5	
Realization of IIR & FIR Filters: Direct form I and Direct form II realization of an IIR filter, Cascade realization of an IIR filter, Parallel realization of an IIR filter, Direct form I realization of FIR filter, Lattice realization of FIR filter.	
Practical component of IPCC	
Experiments to be executed using MATLAB/SCILAB/OCTAVE 1.Verification of Sampling theorem 2.Implementation of DFT using built-in function FFT and user defined function. 3.To perform Circular convolution of two given signals. 4.To perform Auto and Cross Correlation of two given signals 5.To find impulse response of a system 6. IIR filter implementation 7.FIR filter implementation 8. DSP kit experiments for performing linear and circular convolution 9.DSP kit experiment to compute DFT of given signal. 10. DSP kit experiment to find impulse response of a system. 11 DSP kit experiment to add and cancel the noise	
Textbooks: 1. Proakis & Monalakis, “Digital signal processing Principles Algorithms & Applications”, 4th Edition, Pearson Education, New Delhi,2007. **References:** 1. Sanjit K Mitra, “Digital Signal Processing, A Computer Based Approach”, 4 th Edition, McGraw Hill Education, 2013. 2. Oppenheim & Schaffer,“Discrete Time Signal Processing”, PHI,2003. 3. D.Ganesh Rao and Vineeth P, “Digital Signal Processing” Gejji, Cengage India Private Limited, 2017.	
Course outcomes: The students will be able to:	
CO1	Understand the fundamentals of discrete Fourier transform and its properties
CO2	Apply the knowlege of DFT in solving the linear filtering problems
CO3	Apply the mathematical symmetry in DFT to reduce complexity in computations
CO4	Design analog and digital IIR and FIR filters using tranformation and windowing techniques
Continuous Comprehensive Assessments (CCA’s) suggested: Mini project related to Digital signal processing using any modern tools beyond the syllabus which illustrates knowledge gain in the course and implementation of the same.	
Web links/e-resources: https://onlinecourses.nptel.ac.in/noc21_ee20/	

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

ARM Processor (4:0:0) 4

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BEC503**	CIE Marks	50
Teaching Hours/Week (L:T:P)	4:0:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	03

Course objectives:

This course will enable students to:

- Understand the architectural features and instruction set of 32 bit ARM Cortex M3.
- Understand the concept of memory system, exception and cortex implementation.
- Program ARM Cortex M3 using the various instructions and C language for different applications.

Preamble:

The ARM (Advanced RISC Machine) processor is a family of CPUs based on the RISC (Reduced Instruction Set Computer) architecture. Renowned for its energy efficiency and performance, the ARM processor is widely used in a variety of applications, ranging from mobile devices and embedded systems to servers and supercomputers.

Its design focuses on a simplified instruction set, allowing for faster processing speeds and lower power consumption. ARM processors support a diverse ecosystem, with numerous manufacturers producing compatible chips, fostering innovation and competition in the technology sector. As a result, ARM architecture has become a cornerstone in modern computing, powering billions of devices worldwide.

Module – 1

ARM-32 bit Microcontroller: Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture Debugging support, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence (Text 1: Ch 1, 2, 3) (10 Hours)

Module – 2

ARM Cortex M3 Instruction Sets and Programming: Assembly basics, Instruction list and description, Useful instructions. (Text 1: Ch- 4) (10 Hours)

Module – 3

Memory Systems: Memory System Features Overview, Memory Maps, Memory Access Attributes, Default Memory Access Permissions, Bit-Band Operations, Unaligned Transfers, Exclusive Accesses, Endian Mode.

Cortex-M3 Implementation Overview: The Pipeline, A Detailed Block Diagram, Bus Interfaces on the Cortex-M3, Other Interfaces on the Cortex-M3, The External PPB, Typical Connections, Reset Types and Reset Signals. (Text 1: Ch- 5,6) (10 Hours)

Module – 4

Exceptions: Exception Types, Definitions of Priority, Vector Tables, Interrupt Inputs and Pending Behavior, Fault Exceptions, Supervisor Call and Pendable Service Call.

The Nested Vectored Interrupt Controller and Interrupt Control: Nested Vectored Interrupt Controller Overview, The Basic Interrupt Configuration, Example Procedures in Setting Up an Interrupt, Software Interrupts, The SYSTICK Timer. (Text 1: Ch- 7,8) (10 Hours)

Module – 5

Cortex-M3 Programming: Overview, A Typical Development Flow, Using C, CMSIS, Using Assembly, Using Exclusive Access for Semaphores, Using Bit Band for Semaphores, Working with Bit Field Extract and Table Branch.

Exception Programming: Using Interrupts, Exception/Interrupt Handlers, Software Interrupts, Example of Vector Table Relocation, Using SVC, SVC Example: Use for Text Message Output Functions, Using SVC with C. (Text 1: Ch- 10,11) (10 Hours)

Course outcomes: The students will be able to:

CO1	Understand the architectural features and instructions of 32 bit microcontroller ARM Cortex M3.
CO2	Analyze the concepts of memory systems, CORTEX M3 implementation.
CO3	Design the simple Programs using the concept of exceptions and Interrupts.
CO4	Apply the knowledge of Instruction set for Programming ARM Cortex M3 for different applications.

Textbooks

1. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", 2nd Edition, Newnes, (Elsevier), 2010.

Reference:

1. William Hohl, Christopher Hinds, "ARM Assembly Language: Fundamentals and Techniques", 2nd Edition, CRC Press, 2014.

Continuous Comprehensive Assessments (CCA's) suggested:

Mini project: The students have to take up mini projects on embedded domain area.

Web links/e-resources:

- https://www.arm.com/
- https://www.developer.arm.com/
- https://www.arm.com/architecture/cpu

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

ARM Processor Lab (0:0:1) 1

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BECL504**	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:1	SEE Marks	50
Total Number of Contact Hours	24	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand the instruction set of ARM Cortex M3, a 32-bit microcontroller and the software tool required for programming in Assembly and C language.
2. Program ARM Cortex M3 using the various instructions in assembly level language for different applications.
3. Interface external devices and I/O with ARM Cortex M3.
4. Develop C language programs and library functions for embedded system applications.

Preamble:

This course provides insights into ARM assembly programming and also comprehensive programming using embedded C language.

Laboratory Experiments

PART-A: Conduct the following Study experiments to learn ALP using ARM Cortex M3 Registers using an Evaluation board and the required software tool.

1. ALP to multiply two 16-bit binary numbers.
2. ALP to find the sum of first 10 integer numbers.
3. ALP to find number of 0's and 1's in a32-bit data.
4. ALP to find whether given 16-bit number is even or odd.
5. ALP to write data to RAM.

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

1. Interface a simple Switch and display its status through Relay, Buzzer and LED.
2. Display "Hello World" message using Internal UART.
3. Interface and Control a DC Motor.
4. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
5. Interface a DAC and generate Triangular and Square waveforms.
6. Demonstrate the use of an external interrupt to toggle an LED On/Off.
7. Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in

between.	
Course outcomes: The students will be able to:	
CO1	Understand the instruction set of 32-bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language.
CO2	Develop assembly language programs using ARM Cortex M3 for different applications.
CO3	Interface external devices and I/O with ARM Cortex M3.
CO4	Develop C language programs and library functions for embedded system applications.

Conduction of Practical Examination:

Question paper pattern:

- The question paper will have two experiments to be conducted.
- Each full question will be for 50 marks.

Conduction of the experiments carries 70% of the total marks. Write-up and Viva carries 15% each of the total marks.

Continuous Comprehensive Assessments (CCA's) suggested:

Open Ended Experiments: Students need to explore experiments beyond the syllabus.

Web links/e-resources:

- **https://www.exploreembedded.com/wiki/Category:LPC1768_Tutorials**

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Linear Integrated Circuits (3:0:0) 3

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BEC505A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand concepts of operational amplifiers and design various circuits using op-amps.
2. Explain the concept of active filters, timers, oscillators and voltage regulators.
3. Design various circuits using 555 timer, 723 voltage regulators.

Preamble:

Integrated circuits reflect the capabilities of the semiconductor industry to fabricate complex electronic circuits consisting of a large number of components on a single substrate. The operational amplifier or op-amp is the most versatile active element amongst linear ICs. This course covers the design and applications of op-amp and other linear ICs.

Module – 1

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

Operational amplifiers: Basic Op-Amp applications: inverter, Summing Amplifier, Subtractor, Adder/subtractor, Op-Amp circuits using diodes: Half-wave rectifier, Full-wave rectifier, Peak detector, Clipper, Clamper, Sample-and-hold circuit, instrumentation amplifier (8 Hours)

Module – 2

Active filters and oscillators: First-order low pass Butterworth filter, Second order low pass Butterworth filter, first order high-pass Butterworth filter, second order high-pass Butterworth filter, band-pass filter, band-reject filter, all-pass filter.

Oscillators: Phase shift oscillator, wein-bridge oscillator, square wave generator, triangular wave generator. Sawtooth wave generator, voltage-controlled oscillator. (8 Hours)

Module – 3

Comparators and converters: Basic comparator, zero-crossing detector, Schmitt trigger, comparator characteristics, limitations of op-amps as comparators, voltage limiters, Analog-to-digital and digital-to-analog converters: DAC with binary weighted, R and 2R resistor DAC, Successive approximation ADC. (8 Hours)

Module – 4

555 Timer: Monostable multivibrator, frequency divider, pulse stretcher, Astable multivibrator, square wave oscillator, free-running ramp generator.

Phase Locked Loops: Operating principles, phase detector, low pass filter, voltage-controlled oscillator, Monolithic phase locked loops. (8 Hours)

Module – 5

Voltage Regulator: Introduction**,** Series Op-amp regulator, IC voltage regulators, 723 general purpose regulators: high voltage regulator, low voltage regulator, switching regulator.

Summary of the Course: Course covers the fundaments of linear integrated circuits, Op-amp applications, Active filters, applications of 555 timer, phase locked loop and voltage regulator ICs. (8 Hours)

Course outcomes: The students will be able to:

CO1:	**Apply** the knowledge of operational amplifiers to design various circuits.
CO2:	**Analyze** the performance of op-amp circuits for various applications.
CO3:	Demonstrate applications of op-amps using **modern tools**.

Textbooks:

1. Ramakant A Gayakwad, "Op-amps and Linear Integrated Circuits", Pearson, 2019.
2. D Roy Choudhury, Shail Bala Jain, "Linear Integrated Circuits", New age international, Pvt. Ltd., 2018.

Continuous Comprehensive Assessments (CCA's) suggested:

1. Simulation tool exploration to verify the operation of various circuits.
2. Mini project.

Web links / e – resources:

- https://onlinecourses.nptel.ac.in/noc24_ee73/preview
- https://archive.nptel.ac.in/courses/108/108/108108111/

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Electronic Devices (3:0:0) 3

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BEC505B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Understand concepts semiconductor physics.
2. Explain the working of PN junction diode with or without biasing, transient behavior and junction breakdowns.
3. Develop the concept of amplification using BJT and its functioning.
4. Understand the metal-semiconductor contacts along with the working principle of MOS capacitor, MOSFET and the short channel effects of MOSFET.

Preamble:

The subject electronic devices are a cornerstone of modern technology and it is designed to provide students with a thorough understanding of the fundamental principles and operational mechanisms of electronic devices. It covers the theory, design, and application of key electronic components such as diodes, transistors, and integrated circuits. Upon completion of this course, students will possess the foundational knowledge required to innovate in the field of electronics, contribute to cutting-edge research, and apply their skills to solve complex engineering challenges.

Module – 1

Semiconductor Physics: Solids, crystals, energy band, electrons, holes, effective mass, doping, Fermi level, Equilibrium carrier concentration, Direct and indirect semiconductors, Recombination and Generation of carriers, Carrier transport – Drift and Diffusion, mobility, Lifetime Equations of state -Continuity and Poisson equation.

(9 Hours)

Module – 2

P-N Junctions: Thermal equilibrium conditions, depletion regions, depletion capacitance, Forward and Reverse biased junctions, current-voltage characteristics, charge storage and transient behavior, junction breakdowns-Zener breakdown, avalanche breakdown.

(8 Hours)

Module – 3

Bipolar Junction Transistor: Fundamentals of BJT operation, Amplification with BJTS, BJT Fabrication, The coupled Diode model (Ebers-Moll Model), Switching operation of a transistor, Cutoff, saturation, switching cycle, specifications, Drift in the base region, Base narrowing, Avalanche breakdown.

(8 Hours)

Module – 4
MOSFET: **Metal-Semiconductor Contacts**-Schottky barrier and Ohmic contact. **Metal-Insulator-Semiconductor (MIS) Capacitor**-Ideal MIS Capacitor, Silicon MOS capacitor, capacitance voltage characteristics of MOS structure. **MOSFET**-MOSFET structure and basic characteristics, Device Scaling and Short-Channel Effects. **(9 Hours)**
Module – 5
Special Semiconductor Devices: Double gate (DG) MOSFET, FinFET Photodetector, PIN diode, Solar Cell, LED and Lasers. (Only the working principle along with understanding of characteristic parameters and graphs- No derivation). **(6 Hours)** **Summary of the Course:** Course covers the fundamentals of physics behind semiconducting devices, understanding of PN junction diode, BJT, metal-semiconductor contacts, MIS capacitor, MOS capacitor and MOSFET. It also covers the working principle of some special types of optoelectronic devices such solar cell, LED Laser etc.
Course outcomes: The students will be able to:

CO1	**Understand** the basics of semiconductor physics, transport phenomena in semiconductor under equillibrium and non equillibrium conditions.
CO2	**Apply** semiconductor physics principles to evaluate and interpret the electrical behavior and performance of PN junctions
CO3	**Understand** the characteristics of BJT and apply the its working principle in designing amplifiers.
CO4	**Understand** the working principle of MOSFET and its short channel effects.
CO5	**Describe** the working principle of specific semiconducting devices.

Textbooks

1. Ben. G. Streetman, Sanjay Kumar Banerjee, "Solid State Electronic Devices", 7th Edition, Pearson Education, 2016, ISBN 978-93-325-5508-2.
2. Donald A. Neamen, Dhrubes Biswas, "Semiconductor Physics and Devices", 4th Edition, MCGraw Hill Education, 2012, ISBN 978-0-07-107010-2.

References

1. M. S. Tyagi, "Introduction to Semiconductor Materials and Devices", Wiley India Pvt Ltd.
   S. M. Sze and Kwok K. Ng., "Physics of Semiconductor Devices", 3rd Edition, John Wiley & Sons.
2. S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", 7th Edition, Oxford Higher Education.

Continuous Comprehensive Assessments (CCA's) suggested:

Mini Project: The students have to take up mini projects on semiconducting devices in a team using the available softwares/hardware components (as applicable to the choosen project).

The evaluation of AAT is based on min project work demonstration and Report submission.

Quiz: The students need to attend the quiz on numerical problems (e.g. previous year GATE questions).

Web links/e-resources:

- https://nptel.ac.in/courses/108108122
- https://onlinecourses.nptel.ac.in/noc21_mm03/preview
- https://onlinecourses.nptel.ac.in/noc21_ee80/preview
- https://www.youtube.com/watch?v=tjUUU9f2Wpc&list=PLDVC8J0Twuc9DCeiUaM0PRakAqa-lYwmP

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

OOPS with C++ (3:0:0) 3

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BEC505C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:1	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. To inculcate knowledge on Object-oriented programming concepts using C++.
2. To gain Knowledge on programming with C++ and apply the concept learnt on basic syntax as well as core data structures to efficiently to write the code
3. Create and process data in files using file I/O functions
4. Create, Run and execute C++ using code in Visual Studio

Preamble:

Object Oriented programming is a base for learning the Programming and the rapid changes in technology, there is an increasing need to keep the academia abreast of the skill set requirement of the industry. OOP in C++ helps structure code in a way that models real-world entities, making software development more intuitive, flexible, and maintainable. Object-oriented programming aims to implement real-world entities like inheritance, hiding, polymorphism, etc. in programming. The main aim of OOP is to bind together the data and the functions that operate on them so that no other part of the code can access this data except that function.

Module – 1

Introduction to C++ - key concepts of Object-Oriented Programming –Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures : - Decision Making and Statements : If ..else, jump, go-to, break, continue, Switch case statements - Loops in C++ : for, while, do - functions in C++ - inline functions – Function Overloading
(8 Hours)

Module – 2

Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members. (8 Hours)

Module – 3

Operator Overloading: Overloading unary, binary operators – Overloading Friend functions – type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes
(9 Hours)

Module – 4

Pointers – Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.

(8 Hours)

Module – 5

Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCII Files – Random Access Operation – Templates – Exception Handling - String – Declaring and Initializing string objects – String Attributes – Miscellaneous functions Secure Coding in C++ Using Fuzz Testing, Fuzz testing tools, Hackerrank solutions to C++ .

(7Hours)

Course outcomes: The students will be able to:

CO1	Understand the foundational concepts of Object-Oriented Programming (OOP) in C++ and apply control structures, functions etc. to create structured and modular programs.
CO2	Develop skills to define classes, objects, and member functions, including constructors and destructors, for managing data within a class and enabling effective object-oriented design.
CO3	Demonstrate the ability to implement operator overloading and various types of inheritance to enable code reuse and model complex relationships between classes.
CO4	Apply pointers, dynamic memory management, and polymorphism to enhance program flexibility and manage complex data structures in C++.
CO5	Utilize file handling, templates, and exception handling in C++ to manage data storage, implement generic programming, and ensure program robustness

Textbooks

1. E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.

References

1. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
2. Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education 2003.
3. Maria Litvin & Gray Litvin, "C++ for you", Vikas publication 2002

Continuous Comprehensive Assessments (CCA's) suggested:

Mini Project: (Assign small tasks to Develop and demonstrate using C++)
The students have to take up mini projects and the evaluation of AAT is based on min project work demonstration and Report submission.

Web links/e-resources:

- Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
- Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw Tutorial Link:
- https://www.w3schools.com/cpp/cpp_intro.asp
- https://www.edx.org/course/introduction-to-c-3

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

System Verilog (2:1:0) 3

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BEC505D**	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Apply System Verilog concepts to do synthesis, analysis and architecture design.
2. Understanding System Verilog and SVA for verification
3. Analyze coverage-driven verification for the given design under test (DUT).
4. Understand verification features, such as the practical use of classes, randomization, checking, and coverage.

Preamble:

System Verilog is a powerful language specifically designed for hardware description and verification purposes. It provides a rich set of features and constructs that allow verification engineers to test and verify intricate digital designs thoroughly

Module – 1

Verification Guidelines: Introduction, Verification Process, Verification Plan, Verification Methodology Manual, Basic Test bench Functionality, Directed Testing, Methodology Basics, Constrained-Random Stimulus, Functional Coverage. (8 Hours)

Module – 2

Data Types: Built-in Data Types, Fixed-Size Arrays, Queues, Creating New Types with typedef, Creating user-defined Structures.

Basic Object Oriented Programming: Where to Define a Class, OOP Terminology, Creating New objects..

(8 Hours)

Module – 3

Randomization: Introduction, What to Randomize, Randomization in System Verilog, Constraint Details, Solution Probabilities, Controlling Multiple Constraint Blocks, Valid Constraints, In-Line Constraints. (8 Hours)

Module – 4

Functional Coverage: Gathering Coverage Data, Coverage Types, Functional Coverage Strategies, Simple Functional Coverage Example, Anatomy of a Cover Group, Triggering a Cover Group, Data Sampling. (8 Hours)

Module – 5

Overview of UVM- The Typical UVM Testbench Architecture- The UVM Class Library-

Transaction-Level Modeling (TLM) -Overview- TLM, TLM-1, and TLM-2.0 -TLM-1 Implementation- TLM-2.0 Implementation. (8 Hours)

Course outcomes: The students will be able to:

CO1:	Understand the System Verilog concepts to create correct, efficient, and re-usable models and also to create test benches for digital design.
CO2:	Analyze the use of threads and inter process communication for system Verilog.
CO3:	Understand the process of formal verification.

Textbooks

1. Chris Spear, "System Verilog for Verification: A Guide to Learning the Test bench Language Features", Springer 2006.
2. The UVM Primer, An Introduction to the Universal Verification Methodology, Ray Salemi, 2013.

References

1. Janick Bergeron, "Writing Test benches: Functional Verification of HDL Models", Second edition, Kluwer Academic Publishers, 2003.
2. Mark Glasser," Open Verification Methodology Cookbook", Springer, 2009.
3. Andreas S. Meyer, "Principles of Functional Verification", Elsevier Science, 2004.
4. Harry D. Foster, Adam C. Krolnik, David J. Lacey, "Assertion-Based Design", 2nd Edition, Kluwer Academic Publishers, 2004.

Continuous Comprehensive Assessments (CCA's) suggested:

Mini Project: The students have to take up mini projects on system Verilog applications in a team (they need to implement (IEEE conference/ journal paper). The evaluation of AAT is based on min project work demonstration and Report submission.

Web links/e-resources:

- https://verificationguide.com/systemverilog/systemverilog-tutorial/
- https://www.chipverify.com/tutorials/systemverilog
- https://verificationacademy.com/

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Biomedical Signal Processing (3:0:0) 3

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BEC505E**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

This course will enable students to:

1. Describe the origin, properties and suitable models of important biological signals such as ECG and EEG.
2. Know the basic signal processing techniques in analyzing biological signals.
3. Acquire mathematical and computational skills relevant to the field of biomedical signal processing.
4. Know the complexity of various biological phenomena.
5. Describe the basics of ECG signal compression techniques.

Preamble:

This course, Biomedical Signal Processing, delves into the signals generated by the human body, exploring their origin, characteristics and analysis. This course teaches about common biomedical signals like ECG (heart) and EEG (brain), along with techniques for filtering noise, extracting key features, and interpreting the information they carry. By the end, the skills to process these signals and unlock valuable insights into human health and disease will be gained, paving the way for advancements in medical diagnosis, treatment, and monitoring.

Module – 1

Introduction to Biomedical Signals: The nature of biomedical signals, objectives of biomedical signal analysis, difficulties encountered in biomedical signal analysis, Computer aided diagnosis. Case study on Neuralink's brain-machine interface system.

Neurological Signal processing: Brain and its potentials, Electrophysiological origin of Brain waves, EEG signal and its characteristics, EEG analysis, Linear prediction theory, Autoregressive (AR) method, Recursive Estimation of AR parameters, Spectral error measure, Adaptive segmentation. (8 Hours)

Module – 2

Filtering for Artifacts Removal: Random noise, structured noise and physiological interference, stationary versus non-stationary processes, typical case study, time domain filters with application: Synchronized averaging, moving-average filters Frequency domain filters with examples, removal of high frequency noise by Butterworth low pass filters, removal of low frequency noise by Butterworth high pass filter, removal of periodic artifacts by notch and comb filters. Weiner filter.

(8 Hours)

Module – 3

Basics of signal averaging: Signal averaging as a digital filter, A typical average, Software for signal averaging, Limitations of signal averaging.
Acquisition and classification of sleep stages, The Markov model and Markov chains, Dynamics of Sleep-wave Transitions, Hypnogram Model Parameters.

(8 Hours)

Module – 4

Cardiological Signal processing: ECG signal characteristics, ECG Parameters and their estimation, A review of wiener filtering problem, Principle of an adaptive filter, the steepest descent algorithm, Adoptive noise canceller, Cancellation 60Hz Interference in ECG, Cancelling Donor heart Interference in Heart-transplant ECG, Cancellation of Electrocardiographic signals from the electrical activity of chest muscles, Cancelling of maternal ECG in Fetal ECG, Cancellation of higher frequency noise in electro-surgery.

(8 Hours)

Module – 5

Data compression: Direct data compression techniques, Direct ECG data compression techniques, Transformation compression techniques, Other data compression techniques, Data compression techniques comparison.

Biomedical Equipment: Role of biomedical equipment in healthcare, safety standards for the bio-medical equipment. (8 Hours)

Course outcomes: The students will be able to:

CO1:	Analyze the nature of Biomedical signals and related concepts
CO2:	Apply filters and signal compression on biomedical signals.
CO3:	Interpret averaging technique on biomedical signals and extract the features of EEG signals.
CO4:	Evaluate various event detection techniques for the analysis of the EEG and ECG
CO5:	Demonstrate the applications of biomedical signal processing using modern tools.

Textbooks

1. Biomedical signal analysis- A case study approach, Rangayyan Rangaraj, Wiley (IEEE Press)-2005
2. Biomedical Signal Processing- Principles and Techniques - D.C. Reddy, Tata McGraw-Hill, 2005.
3. Biomedical Digital Signal Processing-Willis J. Tompkins, PHI, 2000.

References

1. Biomedical Signal Processing -Akay M, , Academic: Press 1994
2. Biomedical Signal Processing (Vol. I Time & Frequency Analysis) - Cohen. A,, CRC Press, 1986.

Continuous Comprehensive Assessments (CCA's) suggested:

Mini Project: The students have to take up mini projects on biomedical signal processing applications in a team (not more than 4 students) preferably ideas from intelligent signal

acquisition, clinical decision support, ML/DL. The evaluation of AAT is based on project work demonstration and Report submission.

Web links/e-resources:

- https://www.jmir.org/2019/10/e16194/
- https://www.researchgate.net/publication/328275221_Running_head_BIOMEDICAL_EQUIPMENT_TECHNOLOGY_1_Biomedical_Equipment_Technology
- http://ocw.utm.my/pluginfile.php/1102/mod_resource/content/0/SEB4223/01_-_Physiological_Origin_of_Biomedical_Signal.pdf
- http://ocw.utm.my/pluginfile.php/1103/mod_resource/content/0/SEB4223/02-_Physiological_origin_part_2.pdf
- http://ocw.utm.my/pluginfile.php/1109/mod_resource/content/0/SEB4223/07_ECG_Analysis_1_-_QRS_Detection.ppt%20%5BCompatibility%20Mode%5D.pdf
- http://ocw.utm.my/pluginfile.php/1112/mod_resource/content/0/SEB4223/10_EEG_Processing.pdf
- http://ocw.utm.my/pluginfile.php/1113/mod_resource/content/0/SEB4223/11_EEG_Analysis_1-Newborn_Seizure_Detection.pdf
- https://in.mathworks.com/discovery/biomdical-signal-processing.html
- https://library.oapen.org/bitstream/20.500.12657/41663/1/9781439870341.pdf
- https://ieeexplore.ieee.org/book/5264168
- https://www.youtube.com/watch?v=4ktGkqq2PCw
- https://github.com/topics/biomedical-signal-processing?l=matlab "

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Research Methodology and IPR (2:0:0)2

(Common to all Branches)

Effective from the Academic Year 2024-25 (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 copy right.
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 verses 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 method 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 copy right.
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 ELECTRONICS AND COMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Environmental Studies (1:0:0) 1

Common to all Branches

Effective from the Academic Year 2024-25 (2022 Scheme)

Course Code	**BESK508**	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	03

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. **(3Hours)**

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

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 Hour)**

***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:

CO 1: Appraise the significance of ecological systems under the ambit of environment.

CO 2: Analyze for the consequences owing from anthropogenic interactions on the environmental processes.

CO 3: Recommend solutions in the Anthropocene Epoch, with an in-depth understanding of the interdisciplinary facets of environmental issues.

CO 4: Elucidate the trans-national character of environmental problems and ways of addressing them.

CO 5: 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.

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

SEMESTER – V

National Service Scheme (NSS) (0:0:2)

(Common to all branches)

Effective from the Academic Year 2024-25 (2022 scheme)

Course Code	**BNSK559**	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:

- Understand the community in general in which they work.
- Identify the needs and problems of the community and involve them in problem solving.
- Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
- Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
- 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 ELECTRONICS AND COMMUNICATION ENGINEERING

Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

SEMESTER – V

Physical Education (PE) (Sports and Athletics) (0:0:2)

(Common to all Branches)

Effective from the Academic Year 2024-25 (2022 scheme)

Course Code	**BPEK559**	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

- Develop a healthy life style.
- Acquire Knowledge about various stages of sports and games.
- 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 (Course Skill Set):

At the end of the course the students will be able to:

CO1: 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.

CO2: Develops individual and group techno tactical abilities of the game.

CO3: Increases the team combination and plan the strategies to play against opponents.

CO4: Outline the concept of sports training and how to adopt technology to attain high level performance.

CO5: Summarize the basic principles of organizing sports events and concept of technology implemented to organize 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 have to perform asanas.

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)

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Choice Based Credit System (CBCS)

SEMESTER – V

Yoga (0:0:2)

(Common to all Branches)

Effective from the Academic Year 2024-25 (2022 scheme)

Course Code	**BYOK559**	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:

- Understand the importance of practicing yoga in day-to-day life.
- Be aware of therapeutic and preventive value of Yoga.
- Have a focused, joyful and peaceful life.
- Maintain physical, mental and spiritual fitness.
- 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 (Course Skill Set):

At the end of the course students will be able to:

CO1: Understand the requirement of practicing yoga in their day-to-day life.

CO2: Apply the yogic postures in therapy of psychosomatic diseases

CO3: Train themselves to have a focused, joyful and peaceful life.

CO4: Demonstrate the fitness of Physical, Mental and Spiritual practices.

CO5: 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.

Text books:

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

Reference Book:

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 links/e-resources

Web links and Video Lectures (e-Resources): Refer links

1. https://youtu.be/KB-TYlgd1wE
2. https://youtu.be/aa-TG0Wg1Ls

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Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

SEMESTER – V

NCC (0:0:2)

(Common to all Branches)

Effective from the Academic Year 2024-25 (2022 scheme)

Course Code	**BNCK559**	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. **(04 Hours)**

Module– 5

Drill Practical's: Savdhan, Vishram, Salute, Turning, Marching. **(14 Hours)**

Course Outcomes (Course Skill Set):

At the end of the course 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

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Department of Humanities and Social Sciences

Choice Based Credit System (CBCS)

SEMESTER – V

Music (0:0:2)

(Common to all Branches)

Effective from the Academic Year 2024-25 (2022 scheme)

Course Code	**BMUK559**	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:

- Identify the major traditions of Indian music, both through notations andaurally.
- Analyze the compositions with respect to musical and lyrical content.
- Demonstrate an ability to use music technology appropriately in a variety ofsettings.

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, JathiSwara, 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 Geethein Malahari, and one Jathi Swara, One Nottu Swara OR One krithi in a Mela raga, a patriotic song

(14 Hours)

Course Outcomes (Course Skill Set):

At the end of the course the students will be able to:

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

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

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