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BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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

Avalahalli, Yelahanka, Bengaluru 560119

Bachelor of Engineering

Department of Electronics and Telecommunication Engineering

V Semester
Scheme and Syllabus
2022 Scheme Autonomous

BoS meeting : 09.08.2025

Vision of the Department

To emerge as a premier department developing high quality Electronics and Telecommunication Engineering Professionals with ethics and eco-friendliness for betterment of the society.

Mission of the Department

Impart quality education in Electronics and Telecommunication Engineering by facilitating:

M1: Conducive learning environment and research activities **M2:** Good communication skills, leadership qualities and ethics **M3:** Strong Industry-Institute interaction

Program Educational Objectives (PEOs)

After three to four years of graduation our graduates will:

PEO 1: Excel as Professionals in Electronics, Telecommunication and IT related fields.

PEO 2: Engage in life-long learning.

PEO 3: Maintain ethical norms, exhibit good communication skills and leadership qualities.

Program Specific Outcomes (PSOs)

PSO 1: Analyze and design communication systems

PSO 2: Analyze and implement signal processing applications

PSO 3: Design and implement embedded system

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

REVISED

Date: 18-12-2024

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:

IPCC COURSES: 4 CREDITS 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 – 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 will be scaled down to **20 Marks**.
		CIE – Test 2 (1.5 hr)	40			

	CIE – CCA (Comprehensive Continuous Assessment)	CCA	10	05	-	Any one assessment method can be used from the list appended below.
	Total CIE Theory			**25**	**10**	
Practical Component	CIE - Practical		30	15	-	Each laboratory experiment is to be evaluated 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			**25**	**10**	
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**	
The laboratory component of the IPCC shall be for CIE only.						

Professional Core Courses (PCC) / Engineering Science Courses (ESC): 03 and 02 Credit						
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 Course - MCQ						
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**, 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**	

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 18/12/2024

Dean AA 18.12.24

Principal 18/12/24

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

V Semester

Scheme and Syllabus

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institution Affiliated to VTU, Belagavi)

B. E. in Electronics and Telecommunication Engineering

Scheme of Teaching and Examinations – 2022 Scheme

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: ET PSB: ET	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	BET503	Computer Communication Networks		4	0	0	4	50	50	100	3	4
4	PCCL	BETL504	CCN Lab		0	0	1	1	50	50	100	3	2
5	PEC	BET505X	Professional Elective Course I		3	0	0	3	50	50	100	3	3
6	PW	BET506	Mini Project		3	0	0	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		
		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**
BET505A	Information Theory and Coding	BET505D	ARM Microcontroller
BET505B	Embedded System Design	BEC505F	Real Time Operating System - QNX
BET505C	System Verilog		

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 VI 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 TELECOMMUNICATION 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, tactic 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:

Management and entrepreneurship are pivotal in shaping the economic landscape and addressing societal challenges. This course delves into the significance and scope of management, highlighting its importance in driving economic growth and providing sustainable solutions to societal problems. The curriculum examines management from the perspective of national economy, career development, innovations, and emerging trends, providing a comprehensive understanding of managerial functions, levels, roles, and skills.

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.

(8 Hours)

Summary:

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

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: Categories the functions of Managers, Entrepreneurs and their social responsibilities

CO3: Analyse the business environment components in developing a business plan.

CO4: Individually and in teams identify, conceptualize, and develop solutions for successful Entrepreneurial management.

Textbooks:

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

References:

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

Alternate Assessment Tools (AATs) suggested:

- Case Studies on analyzing real or simulated business scenarios, identify problems, and propose solutions.

Web links / e – resources:

- https://www.runn.io/blog/skills-management
- https://www.atlassian.com/work-management/project-management

B.E. ELECTRONICS AND TELECOMMUNICATION 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)	3:0:2	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course Objectives:

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

Preamble:

Digital signal processing is the process of digitizing real-world signals like audio, video, temperature, position, pressure and then manipulating them mathematically. The information is then represented as discrete frequency, time or space so that it can be processed, analysed and synthesized digitally. DSP suppresses noise during transmission without compromising communication. DSP is used primarily in areas of audio signal, speech processing, RADAR, seismology, SONAR, Voice recognition, financial signals, digital communications, digital synthesizers and biomedicine. This course will introduce the learners to know various filter design and constructing various digital signal processors. This can be helpful to acquire knowledge on various applications of DSP processor.

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.

(8 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

(8 Hours)

Module – 3

IIR Filter Design:

Analog Butterworth Filters, Frequency transformation in Analog domain, Analog Filters using Low pass 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.

(8 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.

(8 Hours)

Practical Components for IPCC

Sl.No.	Experiments
	Experiments to be executed using MATLAB/SCILAB/OCTAVE
1	Verification of Sampling theorem
2	Implementation of DFT using builtin 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

Course outcomes:

The students will be able to:

CO1: Apply the knowledge of digital signal processing to find DFT's of various signals

CO2: Analyze the Discrete Fourier Transform (DFT) concept to solve the various signal processing

CO3: Design and compare different types of filter characteristics and their applications.

CO4: Work in a team, to demonstrate the basic operations in signal processing using modern tool

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", 4th 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.

Alternate Assessment Tools (AATs) suggested:

- Implementation of Digital Signal processing concepts to to solve societal problems using modern tools, Submit the report as part of course.

Web links / e – resources:

- https://www.coursera.org/learn/dsp1
- https://onlinecourses.nptel.ac.in/noc19_ee50/preview
- https://www.udemy.com/course/dsp-digital-signal-processing

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Computer Communication Networks (4:0:0) 4

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

Course Code	BET503	CIE Marks	50
Teaching Hours/Week (L: T:P)	4:0:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Understand the basics, concepts of computer networks.
2. Acquire the knowledge of different addresses, protocols of TCP/IP model
3. Familiar with the routing techniques through different media
4. Identify the requirements to establish a computer network.

Preamble:

Importance of Computer Networks , Significance and Scope of the course in economic growth of Nation, Impact of the course on Societal Problems, Career Perspective, Innovations, Research status/trends.

Module – 1

Introduction: Data communication, Networks.
Network Models: The OSI Model, Layers in the OSI model, TCP/IP Protocol Suite, addressing;
Physical Layer and media: Transmission media – Guided media.
Switching : Introduction, Circuit Switched networks, Datagram Networks, Virtual Circuit Networks)

(10 Hours)

Module – 2

Data link layer: Data Link Control (DLC):
Framing, Flow and Error control, Protocols, Noisy Channels;
Multiple Access: Random Access, Controlled Access ;
Wired LANs: Ethernet – IEEE Standards, Standard Ethernet;
Wireless LANs - IEEE802.11, Bluetooth

(10 Hours)

Module – 3

Data Link Layer: Connecting LANs, Backbone networks and Virtual LANs:
Connecting Devices, Backbone Networks, Virtual LANs
Network layer: Logical Addressing:
IPv4 addresses, IPv6 Addresses; **Internet Protocol:** Internetworking, IPv4, IPv6,Transition from IPv4 to IPv6; Address Mapping, ICMP.

(10 Hours)

Module – 4

Network Layer:
Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing Protocol(without application)
Transport layer:
Process to process delivery, User Datagram Protocol (UDP),TCP, SCTP.

(10 Hours)

Module – 5

Congestion control & QOS:
Data traffic, Congestion, Congestion control, Quality of Service, Techniques to improve QoS
Application layer: Domain Name system:
Name space, Domain Name space, Distribution of name space, DNS in the internet, Resolution ;
Remote logging, Electronics mail and File transfer:
Electronic mail, File transfer ; **WWW** and **HTTP:** Architecture, web documents , HTTP.

Course outcomes (Course Skill Set):

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

1. Understand the concepts of computer communication networks
2. Apply the concepts of communication fundamentals/protocols to establish a computer network
3. Analyze the given network parameters/protocols required to construct data communication network.
4. Perform in a group to analyse the performance of given network scenarios/protocols of different layers using wire shark tool and submit the report for the same

Suggested Learning Resources:

Books:

1. Text Books: Forouzan, "Data Communications and Networking", 4th Edition, McGraw Hill, 2013, ISBN: 1-25- 906475-3.

Reference Books:

1. James J Kurose, Keith W Ross, "Computer Networks", Pearson Education.
2. Wayne Tomasi, "Introduction to Data Communication and Networking", Pearson India, 1st Edition.
3. Andrew Tannenbaum, "Computer Networks", Prentice Hall.
4. William Stallings, "Data and Computer Communications", Prentice Hall.

Alternate Assessment Tools (AATs) suggested:

- Perform in a group to analyse the performance of given network scenarios/protocols of different layers using wire shark tool and submit the report for the same

Web links / e – resources:

- **https://networklessons.com/**
- **https://www.networkcomputing.com/**

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER - V

CCN Laboratory (0:0:2) 1
(Effective from the academic year 2024-25, 2022 Scheme)

Course Code	BETL504	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Credits	01	Exam Hours	3

Course objectives:
This laboratory course enables students to
1. Understand and execute basic linux operating system commands for networking
2. Realize Clinet/Server architecture for different application layer protocols
3. Explain the concepts/ algorithms of computer networking
4. Study different protocols at different layers of TCP/IP model

Sl. NO	Experiments
	Part –I: CCN Programming experiments in C/C++
1	Write a program for a HLDC Frame to perform Bit/Character Stuffing & De-stuffing
2	Write a program to compute Polynomial code checksum for CRC-CCITT
3	Write Program for simulation of Stop and Wait protocol
4	Write a Program for Dijkstra's Algorithm to compute the Shortest Routing path
5	Write a Program to find Minimum Spanning Tree of a subnet
6	Write a Program for congestion control using Leaky Bucket Algorithm.
	Part-II: Demonstration Experiments using Linux Operating system
7	Introduction to Linux operating systems- execution of Linux commands
8	Demonstrate the working of Telnet and r-login protocols using client server approach
9	Demonstrate the working of FTP and Mailbox(SMTP) protocols using client server approach
10	Demonstrate the working of SSH and PuTTY client to access server
	Open Ended Experiments (Any two)
1.	Write a program to simulate sliding window protocol
2.	Write a program create two processes using Fork function and communicate between them
3.	Write a Program for RSA Algorithm for Encryption and Decryption of Data.

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER - V

Information Theory and Coding (3:0:0)3

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

Course Code	BET505A	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course Objectives:

This course will enable students to:

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

Preamble:

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

Module – 1

Information Theory:

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

(9 Hours)

Module – 2

Source Coding:

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

(7 Hours)

Module – 3

Information Channels:

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

(7 Hours)

Module – 4

Error Control Coding:

Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting hamming Codes, Table lookup Decoding using Standard Array. Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection.

(9 Hours)

Module – 5

Some Important Cyclic Codes:

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

(8 Hours)

Summary of the syllabus:

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

Course outcomes:

The students will be able to:

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

CO2: Apply knowledge of information coding techniques/algorithms to solve problems related to entropy.

CO3: Apply the concept of source coding to encode the data.

CO4: Analyse linear block codes and cyclic codes used for encoding and decoding of messages.

CO5: Understand the use of Golay, BCH and Convolution codes.

Textbooks:

1. "Digital and analog communication systems", K. Sam Shanmugam, John Wiley India Pvt. Ltd.
2. "Information Theory and Coding", Muralidhar Kulkarni, K.S. Shivaprakasha, Wiley India Pvt. Ltd, 2019.

References:

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

Alternate Assessment Tools (AATs) suggested:

Implementation of Coding techniques using Matlab

Web links / e – resources:

- https://nptel.ac.in/courses/117104129
- https://nptel.ac.in/courses/108108168

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Embedded System Design (3:0:0)3

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

Course Code	BET505B	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course Objectives:

This course will enable students to:

1. Understand the basic programming of Microprocessor and microcontroller.
2. Develop the microcontroller-based programs for various application in simulation environment
3. Program a microcontroller to control an external hardware using suitable I/O ports.

Preamble:

Role of embedded systems and its importance, increased reliability due to their dedicated function, lower power consumption, compact size, and the ability to perform real-time operations, making them suitable for time-sensitive applications.

Module1

INTRODUCTION TO EMBEDDED SYSTEMS:

History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

(8 Hours)

Module 2

TYPICAL EMBEDDED SYSTEM:

Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

(8 Hours)

Module – 3

COMMUNICATION INTERFACE:

On board communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBee, GPRS, GSM.

(8 Hours)

Module – 4

EMBEDDED FIRMWARE DESIGN AND DEVELOPMENT

Embedded firmware design approaches-super loop based approach, operating system basedapproach; embedded firmware development languages-assembly language based development, high level language based development.

(8 Hours)

Module – 5
RTOS BASED EMBEDDED SYSTEM DESIGN: Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication-shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques. **(8 Hours)**
Course outcomes: The students will be able to: CO1: Understand the basic concepts of embedded system design. CO2: Apply the knowledge of design concepts to interface displays, memories, ports, serial ports etc. CO3: Analyze the hardware and firmware design approaches of embedded systems.
Textbooks: 1. "Introduction to Embedded Systems", shibu k v, Mc Graw Hill Education, 2nd Edition, 2023. **2.** "Computers as Components", Wayne Wolf, Morgan Kaufmann, Morgan Kaufmann, 2nd Edition, 2008. **References:** 1. "Embedded System Design", frank vahid, tony grivargis, john Wiley, 2006. 2. "Embedded Systems- An integrated approach", Lyla b das, Pearson education 2012. 3. "Embedded Systems", Raj Kamal, Mc Graw Hill Education, 2008.
Alternate Assessment Tools (AATs) suggested: Perform a group activity to demonstrate embedded systems applications as applicable to real time.
Web links / e – resources: ● https://elearn.nptel.ac.in/shop/nptel/embedded-systems-design/?v=c86ee0d9d7ed ● https://www.arm.com/glossary/embedded-system-design

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

System Verilog (3:0:0) 3

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

Course Code	BET505C	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 test benches for complex digital circuits
2. Apply the knowledge of tests benches using System Verilog
3. Analyze a verification case and apply System Verilog to verify the design
4. Perform in a group to design and present applications of digital circuits using System Verilog

Preamble:

Principles of Combinational Logic and Sequential circuits , Introduction to HDL , Evolution of HDL Four abstraction levels of HDL .

Module – 1

Verification Guidelines:

The verification process, basic test bench functionality, directed testing, methodology basics, constrained random stimulus, randomization, functional coverage, test bench components, layered test bench.

(8 Hours)

Module – 2

Data Types:

Built in Data types, fixed and dynamic arrays, Queues, associative arrays, linked lists, array methods, choosing a storage type, creating new types with type def, creating user defined structures, type conversion, Enumerated types, constants and strings, Expression width.

(8 Hours)

Module – 3

Procedural Statements and Routines:

Procedural statements, Tasks, Functions and void functions, Task and function overview, Routine arguments, returning from a routine, Local data storage, time values.

(8 Hours)

Module – 4

Converting the test bench and design:

Separating the test bench and design, The interface construct, Stimulus timing, Interface driving and sampling, Program Block Considerations, Connecting It All Together, Top-Level Scope ,Program–Module Interactions , System Verilog assertions, The Four-Port ATM Router.

(8 Hours)

Module – 5

Randomization:

Introduction, Randomization in System Verilog, Constraint details, Solution probabilities, Valid constraints, Inline constraints, Random number functions, Common randomization problems, Iterative and array constraints, Random control, Random Number Generators.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Understand test benches for complex digital circuits

CO2: Apply knowledge of tests benches for writing code for System Verilog

CO3: Analyze a verification case and apply System Verilog to verify the design

CO4: Perform in a group to design and present applications of digital circuit using System Verilog

Textbooks:

1. Chris Spear, "System Verilog for Verification, A guide to learning the Test bench language Features" ,Springer Publications Second Edition, 2010.

References:

1. "System Verilog for Design- A guide to using system Verilog for Hardware design and Modeling". Stuart Sutherland, Simon Davidmann, Peter Flake Springer Publications Second Edition, 2006.
2. Janick Bergeron, Eduard Cerny, Alan Hunter, and Andy Nightingale, "Verification Methodology Manual for System Verilog" , Springer Publications, 2006.

Alternate Assessment Tools (AATs) suggested:

- Design and verification applications of digital circuits using System Verilog using Xilinx tool

Web links / e – resources:

- https://www.maven-silicon.com/blog/system-verilog-tutorial-for-beginners/
- https://www.slideshare.net/slideshow/an-overview-of-systemverilog-for-design-and-verification/265866075

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

ARM Microcontroller (3:0:0) 3

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

Course Code	BET505D	CIE Marks	50
Teaching Hours/Week(L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course objectives:

This course enables students to:

1. Understand the architectural features and instruction set of 32 bit microcontroller ARM Cortex M3 and hardware components of an embedded system.
2. Program ARM Cortex M3 using the various instructions and C language for different applications.
3. Develop the programming skills in ARM for various applications

Preamble:

ARM microcontrollers are based on the RISC architecture, which is power efficient and has optimized instruction sets. Usage-ARM microcontrollers are used in most mobile phones and embedded hardware. They are also embedded into multi-core microprocessors (MPUs).Code portability-Engineers can easily port their code from one MCU series to another. Trade-offs:Engineers can choose the right trade-off between energy efficiency, computation performance, security, and range of peripherals for their system.

Module – 1

ARM-32 bit Microcontroller:

Introduction to ARM, Advantages,Applications ,Resources,What are inside typical ARM microcontrollers,What you need to start,Software development flow,Compiling your applications,Software flow,Microcontroller interfaces,CMSIS.

(Text 1-1.1,1.2,1.3,1.4,2.1,2.2,2.3,2.4,2.5,2.8,2.9)

(8 Hours)

Module – 2

ARM Cortex M Instruction Sets:

General information of Cortex M3 and M4,Architecture ,Programmer's model-Operation modes and states,Registers,Special registers,floating point registers,Behaviour of APSR. Programming(basic concepts). **(Text 1-3.1,3.2,4.1,4.2,4.3)**

(8 Hours)

Module – 3

Memory System and Interrupts:

Memory system features,Memory map,Stack memory,Memory protection Unit,Exceptions,NVIC,Vector table,Fault handling,SCB,Debug,Reset and reset sequence

(Text 1-4.4,4.5,4.6,4.7,4.8,6.2)

(8 Hours)

Module – 4

Instruction Set:

Moving data within the processor,Memory access instructions,Arithmetic operations,Logic operations,Shift and rotate instructions,Data conversion operations,Bit-field processing instructions,,Compare and test,Program flow control,Saturation operations,Exception

related instructions,sleep mode and Memory barrier instructions,Floating point instructions. **(Text 1: 5.6,5.7)**

(8 Hours)

Module – 5

Software Porting:

Overview,Porting software from 8-bit/16-bit MCUs to Cortex-M MCUs,Porting from ARM7to Cortex-M3/M4,Porting between different Cortex-M processors **(Text 1: 24.1,24.2,24.3,24.4)**

(8 Hours)

Course outcomes: The students will be able to:

CO1: Understand the basic concepts of ARM Cortex M3/M4 processors and controllers.

CO2: Apply the knowledge gained for programming ARM Cortex-M for different applications.

CO3: Demonstrate the programming skills in ARM for various applications.

Textbooks*:*

1. Joseph Yiu, "The Definitive Guide to the ARM Cortex-3", 2nd Edition, Newnes,(Elsevier),2010 .
2. Steve Furber, "ARM system-on-chip Architecture", 2nd Edition, Pearson India Education Services private Limited, 2000.

References:

1. "Embedded Systems with Arm Cortex-M Microcontrollers in Assembly Language and C", 2nd Edition, 2nd E -Man Press LLC ©2015.
2. The Insider‟s Guide to the ARM7 Based Microcontrollers, Hitex Ltd.,1st edition, 2005.

Web links and Video Lectures (e-Resources):

- NPTL Lectures: https://nptel.ac.in/courses/108102045 Embedded Systems, IIT Delhi, Prof. Santanu Chaudhary

B.E ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

REAL TIME OPERATING SYSTEM - QNX (3:0:0) 3

(Effective from the academic year 2025-26, 2022 Scheme)

Course Code	BEC505F	CIE Marks	50
Teaching Hours/Week(L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course Learning Objectives:

This course will enable students to

- Understand the Basics of RTOS Architecture of QNX Neutrino RTOS
- Apply the knowledge of RTOS for Process and Thread Management
- Analyze the Inter-Process Communication (IPC) in RTOS and QNX
- Develop, Debug and Optimize Embedded Systems and Real-Time Applications

Preamble : C programming and Linux commands.

Objective: Install and configure QNX SDP, Momentics IDE, and target system (real or virtual). Outcome: Understand development workflow in QNX.

Module – 1

RTOS based embedded system : Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, classes operating system, batch processing, multi-programming, time sharing system, real time and distributed operating systems , Structures of OS, BIOS and Boot Process. RTOS concepts and definitions, real- time design issues, examples, Differentiate Between GPOS and RTOS .

(8 Hours)

Module – 2

Processes, Threads & Synchronization: Introduction, Overview of Process , Process states and state transitions . Processes: Creation and Detecting termination, Threads, thread creation ,Operation , Process Termination and Cleanup, Process scheduling: non-pre- emptive and pre-emptive scheduling; Process communication.

(8 Hours)

Module – 3

Real Time Operating Systems: Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use.

Communication interface: On board communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth,
Wi-Fi, ZigBee, GPRS, GSM. **(8 Hours)**

Module – 4

Introduction to QNX Real Time Operating System: Definition Architecture , overview – Executive, Microkernel, Scheduling ,Process manager, Resource manager , System Library , Shared Objects ,OS services , Boot sequence ,Security Inter process Communication, Processes and Threads model, Timing, Interrupt Handling.

QNX Inter-Process Communication:

Message passing and deadlocks: Overview of Message Passing, implementing message passing, Mailboxes, Deadlocks, Deadlocks in resource allocation, Handling deadlocks,

Deadlocks detection algorithm, Deadlocks Prevention
Issues Related to Priorities, Designing a Message Passing System (1 , 2): Event Delivery Shared Memory. **(8 Hours)**

Module – 5

Introduction to Hardware Programming: Hardware I/O, Programming PCI bus devices, Handling Interrupts.
Timers, Clocks and Timeouts: Introduction, Timing Architecture, Getting and Setting the System Clock, Introduction to Timers, High-Resolution Timers, Design Considerations, Kernel Timeouts.
Resource Managers: Introduction, A Simple Resource Manager: Initialization and Handling read() and write(). **(8 Hours)**

Course outcomes:

The students will be able to
CO1: Understand the Basics of RTOS Architecture of QNX Neutrino RTOS
CO2: Apply the knowledge of RTOS for Process and Thread Management
CO3: Analyze the Inter-Process Communication (IPC) in RTOS and QNX
CO4: Develop, Debug and Optimize Embedded Systems and Real-Time Applications

Text Books:

1. Qing Li, Caroline Yao, "*Real-Time Concepts for Embedded Systems"*, 1st Edition, CRC Press, 2003.
2. Modern Operating Systems: Design and Implementation - Andrew S Tanenbaum 4th edition , Pearson, 2015.
3. "Introduction to Embedded Systems" - shibu k v, Mc Graw Hill Education TMH 2009
4. The Linux Programming Interface- Michael Kerrisk ,no starch press san francisco 2010
5. Doug Abbott, "*Linux for Embedded and Real-Time applications"*, 3rd Edition,Newnes publications, 2013.

Reference Books

1. "Operating Systems :A Concept-Based Approach" -Dhamdhere Mc Graw Hill 2nd edition 2009
2. "Embedded Systems- Architecture, Programming and Design", Rajkamal, TMH,2007.
3. Jane W. S. Liu, "Real-time systems", Prentice Hall, 2000.

B.E. ELECTRONICS AND TELECOMMUNICATION 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 a 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 TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Environmental Studies (1:0:0) 1

(Common to all Branches)

(Effective for the 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	ExamHours	01

Course Objectives:

The course will enable the 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. **(3 Hours)**

***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 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 o f 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.

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. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

National Service Scheme(NSS)

(Common to all branches)

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

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 & gainskills 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 integrationand 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 TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Physical Education/Sports

(Common to all Branches)

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

Course Code	BPEK509	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:0	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, "Textbook 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 ofSports, Robotics, and Rehabilitation", 2021, The MIT Press
5. MCARDLE W.D. "Exercise Physiology Nutrition Energy And Human Performance" 2015, LWW IE (50)

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Yoga

(Common to all Branches)

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

Course Code	**BYOK509**	CIE Marks	100
Teaching Hours/Week (L:T:P)	0:0:0	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.

(04Hours)

Module – 2

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

(06Hours)

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, UniversalLOVE, Benefits of practice of Spirituality in day-to-day life, practical classes.

(04Hours)

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 paperBacks: vision Books Pvt.Ltd., 1982.

3. B.K.S Iyenkar: Light on the Yoga sutras of patanjali (Haper Collins Publications IndiaPvt.,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 PublishingLimited, 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. Web resources Dr. Shirley Telles: Glimpses of Human Body (Vivekanda Kendra Yoga PrakashanaBangalore)
5.

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

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

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

NCC

(Common to all Branches)

(Effective for the 2022 scheme)

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 Shipsand 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.

(08 Hours)

Course outcomes:

The students will be able to:

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

CO2: Get motivated and trained to exhibit leadership qualities in all walks of life and bealways 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 duringthe 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”, DevPublications,2000.
- Gautam Sharma, “Valour and Sacrifice: Famous Regiments of the Indian Army”, AlliedPublishers,1990.

B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Music

(Common to all Branches)

(Effective for the 2022 scheme)

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, 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 GeetheinMalahari, 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 (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 whichthe 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", VipanciCharitable 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.