Semester III

Code	Course	L	T	P	Credits
ECPC-201	Electronic Devices and Circuits	3+1	0	0	3
ECPC-202	Digital Design	3+1	0	0	3
ECPC-203	Signals, Systems & Random Variables	3+1	0	0	3
ECPC-204	Fields and waves	3+1	0	0	3
ECPC-205	Communication Engineering	3+1	0	0	3
MAIC-xxx	Machine Learning & Data Analytics	3	0	0	3
ECPC-206	Electronics-I Lab	0	0	2	1
ECPC-207	Digital Design lab	0	0	2	1
ECPC-208	MATLAB Programming Lab	0	0	2	1
SWAU-11	NCC/NSS/Yoga	0	0	2	1*
SWAU-12	Sports/Club/Technical Societies	0	0	2	1*
	Total				22

*Continuous Evaluation Model as per guidelines and the credit to be awarded at the end of 6^{th} semester based on cumulative performance upto 6^{th} semester.

Semester IV

Code	Course	L	T	P	Credits
ECPC-209	Analog Electronics	3+1	0	0	3
ECPC-210	Digital Communication	3+1	0	0	3
ECPC-211	Computer Architecture	3+1	0	0	3
ECPC-212	Information Theory and Coding	3	0	0	3
XXIC-XX	Applied Linear Algebra (Maths-III)	3	0	0	3
ECPC-213	Electronics-II Lab	0	0	2	1
ECPC-214	Communication Engineering Lab (Comm. Lab -I)	0	0	2	1
ECPC-215	Digital Communication Lab (Comm. Lab -II)	0	0	2	1
CSLR-xxx	Object Oriented Programming Lab	1	0	2	2
SWAU-11	NCC/NSS/Yoga	0	0	2	1*
SWAU-12	Sports/Club/Technical Societies	0	0	2	1*
	Total				20

*Continuous Evaluation Model as per guidelines and the credit to be awarded at the end of 6^{th} semester based on cumulative performance upto 6^{th} semester.

Course Code	:	CSIC 221
Course Title	:	Machine Learning & Data Analytics
Number of Credits and L/T/P scheme	:	4 & 3/0/2
Prerequisites (Course code)	:	Problem solving & Programming using C
Course Category	:	IC (CE, EE, ECE, ME, PIE, IIOT, M & C)

Course Learning Objectives:

1. The major goal of the course is to allow computers to learn (potentially complex) patterns from data, and then make decisions based on these patterns.
2. To provide strong foundation for data science and application area related to it.
3. To provide the underlying core concepts and emerging technologies in data science.
4. A data scientist requires an integrated skill set spanning mathematics, probability and statistics, optimization, and branches of computer science like databases, machine learning etc.

Course Content

1. **Introduction to Data Science:** What is Data Science? Linear algebra for datascience:- algebraic and geometric view, Data Representation & Statistical Inference:- Data objects and attribute types, Types of Data, descriptive statistics, notion of probability, distributions, mean, variance, covariance, Understanding univariate and multivariate normal distributions.
2. **Data Analysis:** Probability and Random Variables, Correlation, Regression, Attribute Transformation, Sampling, Feature subset selection, Similarity measures, High-dimensional Data: - Curse of Dimensionality, Dimensionality reduction: PCA, SVD, etc.
3. **Data Visualization, Bayesian Learning& Evaluating Hypotheses:** Basic principles, Scalar, Vector, & Tensor Visualization, Multivariate Data Visualization, Text Data Visualization, Network Data Visualization, Visualization Techniques, Bayesian Approach, Bayes' Theorem, Evaluating Hypotheses- Z-test, T-test, Chi-square Test.
4. **Machine Learning (Supervised & Unsupervised Learning):** Basic concepts of Classification, k-Nearest Neighbor, Decision Tree classification, Naïve Bayes' Classifier, Linear Regression Models, Logistics Regression, Basic concepts of Clustering, K-means, Hierarchical Clustering, DBSCAN.

Text Books:

1. U Dinesh Kumar and Manaranjan Pradhan, Machine Learning using Python, John Wiley & Sons,2020.
2. Cathy O 'Neil and Rachel Schutt., Doing Data Science, Straight Talk From The Frontline, O 'Reilly. 2014.
3. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, PHI, 2010.

Reference Books:

1. T. Hastie, R. Tibshirani and J. Friedman., The Elements of Statistical Learning, Second Edition, Springer, 2009.
2. Christopher M. Bishop F.R.Eng., Pattern Recognition and Machine Learning, Springer, 2006.
3. J. Grus., Data Science from Scratch, Second Edition,O'Reilly. 2019.
4. Douglas C. Montgomery, George C. Runger., Applied Statistics and Probability for Engineers, Third Edition, John Wiley & Sons, Inc., 2003.
5. Tom M.Mitchell, Machine Learning, McGraw-Hill International Edition, 1997.

Course Outcomes

1. Explore the fundamental concepts of data science and machine learning.
2. Understand the processes of data science - identifying the problem to be solved, data collection, preparation, evaluation and visualization.
3. Understand data analysis techniques for applications handling large data.
4. Visualize and present the inference using various tools.
5. Understand various machine learning algorithms used in data science process.

ECPC-201 ELECTRONIC DEVICES AND CIRCUITS

Pre-requisite:PHIC-11 and PHIC-13

L	T	P	Credits	Total contact hours
3+1	0	0	3	40

Brief Description of the Course:

To enable the students to understand the working principle of diodes and transistors for circuit applications.

Course Content

UNIT I **10 hrs**

Review of P-N JUNCTIONS: abrupt and linearly graded junctions. V-I characteristic, C-V characteristic, Zener and Avalanche Breakdown. Diode circuit model. P-N junction applications: Rectifiers, Clipping and Clamping Circuits, Voltage Regulator.

UNIT II **10 hrs**

BJT: Ideal and Real transistor, I-V Characteristics, Small signal equivalent circuits, High frequency and Switching Transistors, BJT as an amplifier – Biasing, small Signal analysis. Frequency response. BJT equivalent circuit models- DC model, h-parameter model, r_e model and hybrid- π model. Power transistors.

UNIT III **10 hrs**

Theory of field effect transistors: Static characteristics of JFETs and MOSFETs; Analysis of MOS structure, MOS capacitor C-V and concept of accumulation, depletion and inversion; Threshold Voltage, MOSFET I-V and C-V characteristics and small signal models, Body bias. Short channel effects: SS, DIBL, GIDL, surface mobility, CLM.

UNIT IV **10 hrs**

JFET and MOSFET single-stage amplifiers: Biasing, Small signal analysis, Frequency Response. Feedback Amplifiers and Oscillators.

Case study: Electronic waste management, IKS-based solutions.

Text Books / Reference

1. J. Millman and C. Halkias, Integrated Electronics, McGraw Hill, 2nd Edition, 2009.
2. Behzad Razavi, Design of analog CMOS Integrated circuits, McGraw Hill, 2002.
3. Tyagi M.S., “Introduction to Semiconductor Materials and Devices”, John Wiley & Sons, 1993.
4. Streetman B.G., Banerjee, S.K, “Solid State Electronic Devices”, Pearson Education, 6th Edition 2006.
5. Y. Taur and T. K. Ning, Fundamentals of Modern VLSI Devices, Cambridge University Press
6. A. Sedra and C. Smith, Microelectronic Circuits: Theory and Applications, Oxford University Press, 6th Edition, 2013.

Course outcomes

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

CO1: Understand the working principle of the P-N junction diode, BJT, JFET, and MOSFET.
CO2: Understand the short-channel effects in MOS devices.
CO3: Understand BJT, JFET, and MOSFET's small signal analysis and circuit applications.
CO4: Design and analysis of feedback and oscillator circuits.

ECPC-202 DIGITAL DESIGN

Pre-requisite: PHIC-13

L	T	P	Credits	Total contact hours
3+1	0	0	3	42

Brief Description of the Course:

Course Learning Objectives

This course will enable students to:

- Learn Boolean equation based design of digital and sequential circuits
- Understand the importance of logic families and design transistor-based gates and circuits
- Implement digital circuits on FPGAs and evaluate their power and performance

UNIT I **12 hrs**

NUMBER SYSTEMS AND CODES: Binary, octal, and hexadecimal number systems, Conversion between number systems, Complements of binary numbers, BCD codes, Gray codes, and ASCII codes.
BOOLEAN ALGEBRA AND LOGIC GATES: Boolean algebra: Boolean laws, De Morgan's theorem, Boolean functions, Karnaugh maps, QM Method, Basic logic gates: AND, OR, NOT gates and their truth tables, Universal gates: NAND, NOR, XOR, and XNOR gates, Logic gate circuits and their applications. TTL , CMOS , ECL logic families, fan in, fanout.

UNIT II **12 hrs**

COMBINATIONAL CIRCUITS: Adders and subtractors: Half adder, full adder, ripple carry adder, carry look-ahead adder, subtractor circuits, Multiplexers and demultiplexers, Encoders and decoders, Comparators and magnitude comparators, Parity generators and checkers
SEQUENTIAL CIRCUITS: Latches and flip-flops: SR flip-flop, D flip-flop, JK flip-flop, T flip-flop, Registers: shift registers, parallel in/serial out (PISO) registers, serial in/parallel out (SIPO) registers, and parallel in/parallel out (PIPO) registers, Counters: ripple counter, synchronous counter, and Johnson counter.

UNIT III **10 hrs**

MEMORY ELEMENTS: SRAM, DRAM, and ROM, Finite State Machines (FSMs): Mealy and Moore models, state diagrams, state tables, and state reduction techniques,
DIGITAL SYSTEM DESIGN: Digital system design flow and design methodology, Timing analysis and timing constraints, Clock domains and clock distribution, Synchronous and asynchronous design techniques

UNIT IV **8 hrs**

INTRODUCTION TO FPGA ARCHITECTURE AND PROGRAMMING: FPGA based design flow. Two real time Case Studies. Power optimization techniques: Dynamic and Static Power Dissipation, Power gating, clock gating, data gating.

Reference Books:

1. M. Morris Mano and Michael Ciletti, Digital Design.
2. Thomas L. Floyd and R. Brockwell, Digital Fundamentals.
3. Stephen Brown and Zvonko Vranesic, Fundamentals of Digital Logic with Verilog Design

4. Giuliano Donzellini and Luca Oneto, Introduction to Digital Systems Design
5. Guy Even and Moti Medina, Digital Logic Design: A Rigorous Approach

Course Outcomes

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

CO1: Understand how to write Boolean equations and simplify them
CO2: Design digital circuits and develop applications
CO3: Design sequential circuits, FSMs, state reductions and develop optimized circuits and applications
CO4: Understand programmable device, their applications, design flow,
CO5: Understand power consumption of circuits, its pros and cons and reduction techniques.

ECPC-203 SIGNALS, SYSTEMS AND RANDOM VARIABLES

Pre-requisite: Mathematics (MAIC-11, MAIC-12)

L	T	P	Credits	Total contact hours
3+1	0	0	3	40

Brief Description about the course:

The course on signals, systems and random variables provides a foundation for the design and analysis of various engineering and behavioural science systems. It contains description of various discrete time and continuous signals, convolution integral and convolution sum, LTI systems, Fourier series and Fourier Transform and their important properties. Random variables and processes are dealt with in detail. Several important distribution functions applicable to different engineering fields are included. The students shall be able to apply the knowledge to various science and engineering fields.

Course Learning Objectives

To understand LTI systems, analysis of periodic signals, analysis of aperiodic signals, random variables and random processes.

Course Content

UNIT I **10 hrs**

LTI SYSTEMS: Continuous time and discrete time signals, Even and Odd signals. Elementary continuous time and discrete time signals. Classification of signals, causality; stability, time invariance, linearity. Continuous time and Discrete time LTI Systems, convolution Integral and convolution sum, Properties of LTI Systems. Differential and Difference equations. Singularity functions.

UNIT II **11 hrs**

FOURIER ANALYSIS OF SIGNALS: Fourier series representation of continuous time and discrete time periodic signals. Fourier series and LTI Systems. Laplace Transform and concept of ROC. Continuous Time Fourier Transform (CTFT). Properties of CTFT. Discrete time Fourier Transform (DTFT). Properties of DTFT. Systems characterized by Linear constant co-efficient differential equation and difference equations. Magnitude and phase spectrum, group delay.

UNIT III **11 hrs**

RANDOM VARIABLES: Probability, Conditional Probability, definition of random variables, cumulative distribution function, probability density function, discrete random variables, continuous random variables, mathematical expectation, moments of random variables. Chebyshev inequality. Some important distribution functions: uniform, rectangular, Gaussian, Bernoulli, binomial, Poisson, Exponential, Rayleigh, Rice, lognormal, and chi square. Sum of random variables, Functions of random variables. Joint distribution, marginal and conditional distributions, statistical independence, Central Limit Theorem, moments and Characteristic Functions,

UNIT IV **8 hrs**

RANDOM PROCESSES: Definition and description of Random Processes, Classification of random processes, statistical characterization, mean, correlation and covariance functions, Stationary random processes, Ergodicity, Power Spectral density, Weiner-khintchine theorem, Response of memory- less and linear systems to random inputs, discrete time stochastic processes, Cyclostationary processes, Gaussian, Poisson, Markov processes.

Reference Books:

1. Oppenheim Willsky and Nawab, Signals and Systems, PHI. 4th Ed
2. Simon Haykin , Signals and Systems, John Wiley 4th Ed
3. Taub and Schilling, Principles of Communication Systems, TMH. 4th Ed

4. Papoulis, A. Probability, Random Variables and Stochastic Processes, MGH, 3rd Ed.
5. Gray, R.M. Davission,L.D,Introduction to Statistical Signal Processing- Web Edition-1999.
6. Sundarapandian, V. Probability, Statistics and Queueing Theory, PHI Learning Private Limited, 3rd Ed.

Course outcomes:

1. Utilize the concepts of Discrete time and Continuous time signals and their transformations.
2. Analyze the Fourier series of periodic and Fourier transform of non-periodic discrete time and continuous time signals.
3. Understand and apply the concepts of Fourier series and Fourier transform.
4. Characterize probability models and function of random variables based on single & multiples random variables.
5. Evaluate and apply moments & characteristic functions and understand the concept of inequalities and probabilistic limits.
6. Understand the concept of random processes and determine covariance and spectral density of stationary random processes.

ECPC-204 FIELDS & WAVES

Prerequisites: MAIR 11

L	T	P	Credits	Total contact hours
3+1	0	0	3	42

Brief Description

Fields and Waves (FW) is a highly abstract and complex subject that examines how exerting a force on charged particles is affected by the presence and motion of adjacent particles. The interdependence of the time varying electric and magnetic fields—one producing the other, and vice versa—has allowed the students to consider them as a single coherent entity: the electromagnetic field. Under this umbrella, students can learn about numerous and varied topics ranging from the basics of steady electric and magnetic fields to transmission lines including waveguides along with their real-life applications.

Course Content

UNIT I **10 hrs**

Overview of electromagnetic fields and wave phenomena, Historical background and key concepts, Electrostatic Fields: Coulomb's law and electric field intensity, Electric potential and potential gradient, method of images, Gauss's law and its applications, Conductors, dielectrics and their boundary conditions, Poisson’s and Laplace’s equations, uniqueness theorem.

Magnetostatic Fields: Biot-Savart law and magnetic field intensity, Ampere's law and its applications, magnetic vector potentials, Magnetic materials and boundary conditions, magnetic circuits, Inductance and magnetic energy

UNIT II **10 hrs**

Faraday’s law of electromagnetic induction, Maxwell’s equations in point form and integral form, Maxwell’s equations for sinusoidal variations, retarded potentials.

Plane waves and their characteristics, Wave propagation in lossless and lossy media, Boundary conditions for electromagnetic fields, Poynting vector and power considerations, Reflection, transmission, and refraction of waves, SWR, Wave polarization and polarization transformations

UNIT III **10 hrs**

Transmission line equations, graphical methods, Smith chart, Impedance Matching, Rectangular and cylindrical waveguides, Modes of propagation, Resonant cavities and cavity resonators, power flow in wave guides, excitation of wave guides, dielectric waveguides.

UNIT IV **12 hrs**

Applications of Fields and Waves in various sustainable technologies, case studies from the Indian knowledge system.

Reference Books:

1.E. C. Jordan and K. G. Balmain, Electromagnetic Waves and Radiating Systems, PHI, 3rd Ed..

2.David & Chang, Field and Wave Electromagnetics, Addison Wesley, 3rd Ed..

3.W. H. Hayt, Engineering Electromagnetics , JR. Tata Mc-Graw Hill Edition, Fifth edition.

4. Sadiku, Matthew NO, and Shrikrishna V. Kulkarni. Principles of electromagnetics. Vol. 6. New Delhi, India: oxford university Press, 2015.

Course outcomes

At the end of the course student will be able to.

1. Review the basics of electromagnetic theory
2. Comprehend the effects of sinusoidal time variation in both electric and magnetic fields using Maxwell equations and retarded potentials.
3. Understand the propagation of electromagnetic waves through different media and apply the above knowledge to understand working of transmission lines and waveguides.
4. Practice the use of Field and Waves in various real-life applications.

ECPC-205 COMMUNICATION ENGINEERING

Pre-requisite: Signals & Systems (ECPC-203)

L	T	P	Credits	Total contact hours
3+1	0	0	3	42

Brief Description about the course

The course will provide the fundamentals and basic concepts of different modulation and demodulation schemes. The effect of AWG noise on these systems.

Unit - I **8 hrs.**

Introduction

Analog and digital signals/sources and systems, deterministic and random signals, frequency allocations, block diagram of a communication system. Modulation, need for modulation. Sampling theorem, Analog-to-digital conversion schemes: PCM, MD, ADM etc.

Unit – II **16 hrs.**

Amplitude Modulation and Angle Modulation Systems:

Frequency translation, a method of frequency translation, recovery of base-band signal. Amplitude modulation (AM), Representation of band pass signals, Generation and Demodulation of different AM waves. Comparison among AM, DSBSC, and SSBSC.

Phase modulation (PM) and Frequency Modulation (FM), Relationship between FM and PM, Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave - Generation of FM Waves, Detection of FM, Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM and AM.

Unit - III **9 hrs.**

Pulse Modulation & Receivers:Pulse analog modulations, PAM, PWM, PPM. Generation and demodulation of pulse modulated signals.

Radio Receivers: Tuned radio frequency receiver (TRF), Super-heterodyne receiver (SRF), AFC and AGC. FM Receivers, Comparison of AM & FM Receivers

Unit – IV **9 hrs.**

Noise: Introduction to noise. Performance analysis of AM and FM receivers under AWGN. Threshold effect in Angle Modulation System, Pre-emphasis and de-emphasis.

Detection of faults in AM and FM receivers. Recent applications of AM and FM. Medical image analysis using AM-FM model a case study.

Text Books / Reference:

1. Simon Haykins , Communication Systems , Wiley & Sons , 4th Edition.
2. Herbert Taub, and Donald L. Schilling, Principles of Communication Systems, TMcGraw-Hill.
3. B.P. Lathi, Modern Digital and Analog Communications, Oxford.
4. George Kennedy and Bernard Davis, Electronics & Communication Systems.
5. Kyriacos P Constantinou, et. al., Medical Image Analysis Using AM-FM Models and Methods, IEEE Reviews in Biomedical Engineering, 2020.

Course Outcomes:

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

CO1: Understand different modulation and demodulation schemes.
CO2: Analyze power requirement of different waveforms of modulated signals.
CO3: Analyze different characteristics of receiver.
CO4: Compute the effect of noise by computing SNR in AM and FM receivers.

ECPC-206 ELECTRONICS-I LAB

Pre-requisite: PHIC-11, PHIC-13, ECPC-201

L	T	P	Credits	Total contact hours
-	-	2	1	20

Brief Description of the Course:
This course is designed to apply knowledge of analog electronics to a hands-on laboratory experience. To design and analyze various electronic circuits using p-n junction diode, Zener diode, BJT, JFET and MOSFET, assemble and make performance measurements on analog circuits, perform hand-worked analytical analysis of these circuits, and write formal laboratory reports summarizing the results obtained, and discussing the correlation between the analytical predictions and the observed behaviors.

List of Experiments:

1. PN Junction diode characteristics.
    A. Forward bias
    B. Reverse bias.
2. Zener diode characteristics and voltage regulator.
3. Half wave Rectifier with and without filter.
4. Full wave Rectifier with and without filter.
5. Transistor CB characteristics (Input and Output).
6. Transistor CE characteristics (Input and Output).
7. Frequency response of CE Amplifier.
8. Frequency response of CC Amplifier (Emitter Follower).
9. FET Characteristics
10. Frequency Response of single stage RC coupled Amplifier.
11. Frequency Response of double stage RC coupled Amplifier.

Course Outcomes: At the end of the course the student will be able to:

CO 1. To familiarize students with measuring instruments.
CO 2. To demonstrate students the working and input-output characteristics of p-n junction diode, Zener diode, BJT, JFET and MOSFET.
CO 3. To demonstrate students Halfwave & Full wave Rectifier with and without filter.
CO 4. To demonstrate students the working of single stage amplifier using BJT and MOSFETs.

ECPC-207 DIGITAL DESIGN LAB

Pre-requisite: PHIC-13, ECPC-202

L	T	P	Credits	Total contact hours
-	-	2	1	20

Brief Description of the Course:

This course is designed to apply knowledge of digital electronics to a hands-on laboratory experience. To familiarize students with the working of ICs of logic gates, MUXs, Encoder, Decoder, Flip-Flops etc. To demonstrate students the realization of MUXs/De-MUX, Encoder, Decoder, Flip-Flops etc. with the help of basic ICs. To enable students to realize one FIlip-Flop with the help of other Flip Flops. At the end of the course, the student will be able to: To enable the students to design counter, shift registers, adder, subtractor etc. with the help of basic ICs.

List of Experiments:

1. Introduction to Digital Design Lab- Nomenclature of Digital ICs, Specifications, Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs.
2. Study and Verify (a) Demorgan's Theorem for 2 variables. (b) The sum-of product and product-of-sum expressions using universal gates.
3. Design and implementation of (a) Full Adder using basic logic gates. (b) Full subtractor using basic logic gates.
4. Implementation and Verification of Decoder/De-Multiplexer and Encoder using Logic Gates.
5. Realization of the following flip-flops using NAND Gates. (a) Clocked SR Flip-Flop (b) JK Flip-Flop.
6. Realisation of 2-bit comparator using gates and study of four-bit comparator.
7. Realization of following shift registers using IC7474 (a) SISO (b) SIPO (c) PISO (d)PIPO.
8. Design and implementation of MOD-12 up and down counter.
9. Design and study of BCD to 7-segment converter.
10. Design of a 3-input NAND gate and its simulation using suitable logic simulator.
11. Design of a 3-input NOR gate and its simulation using suitable logic simulator.

Course Outcomes: At the end of the course the student will be able to:

CO 1: Construct digital circuit to examine Boolean algebra, truth table of different logic gates.

CO 2: Design various combinational and sequential circuits after analysing their timing properties.

CO 3: Understand the use of digital ICs of different logic functions.

CO 4: Design different types of counter, shift registers, adder, subtractor with the help of ICs.

ECPC-208 MATLAB PROGRAMMING LAB

Pre-requisite: MAIC-11

L	T	P	Credits	Total contact hours
0	0	2	1	20

Brief Description:

This lab aims to get familiarize the students about the numerical computing in various fields. MATLAB allows matrix manipulations, plotting the function by using polar & contour3 commands, implementation of algorithms & creation of user interfaces. It calculates their design, waveforms, graphs, circles, circular helix and solves various integral and differential equations. Using MATLAB symbolic math toolbox, determine the Laplace transform. Further in this lab students will attain the knowledge about convolution and cross correlation between two sequences.

List of Experiments

1. To study Basic MATLAB arithmetic Commands.
2. For an electrical circuit with an inductance L=0.01 mH and resistance R=100Ω, the damped natural frequency of oscillation f=$\sqrt{\frac{1}{LC} - \frac{R^2}{4C^2}}$ write a progoram to calculate the frequency for different values of c varying from 0.1 to 1 in step of 0.01.
3. Write a MATLAB program to define the vectors:

$$\bar{u} =< 1,2,3,4 > and\ \bar{v} =< 2,3,4,5 >$$

Now determine the following using MATLAB

a) Multiply the vector v with a scalar quantity i. e. $5\bar{v}$

b) Take the power of 5 of a vector i. e. $\bar{u}^5$

c) Take the power of 5 of a vector i. e. $\bar{v}^5$

d) Multiply the vectors element by element i. e. $\overline{u.* v}$

e) First take the transpose of a vector and then multiply the vectors element by element $\bar{u}.* \bar{v}^t$

4. Write a MATLAB program to calculate:
   (i) Summation of a number k from 0 to 100 i.e. $\sum_{k=0}^{100} \boldsymbol{k}$
   (ii) Summation of a number $\mathbf{k^2}$ from 0 to 100 i.e. $\sum_{k=0}^{100} \boldsymbol{k^2}$
   (iii) Summation of a number 1/k from 0 to 100 i.e. $\sum_{k=1}^{100} {}^{\mathbf{1}}/_{\boldsymbol{k}}$
   (iv) Summation of a number 1/$\mathbf{k^2}$ from 0 to 100 i.e. $\sum_{k=1}^{100} {}^{\mathbf{1}}/_{\boldsymbol{k^2}}$
5. Write a MATLAB program to break a function, f(x) into odd and even parts, one can compute the two function

$$f_{odd}(x) = \frac{f(x) - f(-x)}{2}$$

$$f_{even}(x) = \frac{f(x) + f(-x)}{2}$$

6. Calculate using MATLAB
   (i) Define the symbolic variable x.
   (ii) Define the symbolic function $y = e^x$
   (iii) Define the symbolic function $y = e^{-x}$
   (iv) Using the result of previous two sections, calculate $f_{odd}(x)$ and $f_{even}(x)$ for the function $y = e^x$
7. Write a MATLAB program to generate different waveforms –
   (i) Square wave
   (ii) Sine wave
   (iii) Triangle wave
   (iv) Exponential wave
   (v) unit step function
   (vi) unit impulse function
   (vii) A rectangular pulse of width 2
   (viii) Unit ramp function
8. Draw graphs of the functions using MATLAB

$(i)\frac{\sin x}{x}$ $(ii)\frac{1}{(x-1)^2}+x$ $(iii)\frac{x^2+1}{x^2-4}$ $(iv)\frac{(10-x)^{\frac{1}{3}}-2}{(4-x^2)^{\frac{1}{2}}}$

9. Draw the circle of radius r=5 using MATLAB.

10. Write a function in MATLAB for factorial to compute the factorial n! . for n= 50.

11. Write a MATLAB program to compute sum of all powers of 2 below 50 using while command.

12. Write a MATLAB program to solve the equations:

-6*x* - 2*y* + 2*z* = 15

-3*x* + 4*y* - 3*z* = 13

2*x* + 4*y* - 7*z* = -9

13. The Fibonacci sequence starts off with the numbers 0 and 1, then succeeding terms are the sum of its two immediate predecessors. Write a MATLAB program for Fibonacci series.

14. Write a MATLAB program for the calculation of the following:

1-1/2+ 1/3- 1/4 + 1/5 …….

15. Write a MATLAB program to generalize for the following:

$$s(20) = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots + \frac{1}{20^2}$$
$$s(21) = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots + \frac{1}{21^2}$$
$$\vdots$$
$$s(100) = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots + \frac{1}{100^2}$$

16. The area, A, of a triangle with sides of length a, b and c is given by $A = \sqrt{(s-a)(s-b)(s-c)}$ where s=(a+b+c)/2. Write a Matlab function that will accept the values a, b and c as inputs and return the value of A as output.

17. Write a MATLAB program for a positive number to compute and display the even powers of 2 less than or equal to positive number.

18. Use the command plot3(x,y,z) to plot the circular helix $x(t) = \sin t\,, y(t) = \cos t\ , z(t) = t, 0 \leq t \leq 20$

19. Plot the surface defined by the function using MATLAB:

$f(x,y) = (x-3)^2 + (y-2)^2$ for $2 \leq x \leq 4$,$1 \leq y \leq 3$

20. Find the solution of first order ODE:

$$\dot{x} = 2x + 5\sin t\,, x(0) = 1$$

21. Plot $r^2 = 2\sin 5t,\ for\ 0 \leq x \leq 2\pi$ using polar command in Matlab.

22. Plot $z = -\frac{5}{1+x^2+y^2}, for\ |x| \leq 3, |y| \leq 3$ using contour3 command in Matlab.

23. Compute the following integral:

$$I = \int_{-1}^{1}\int_{0}^{2}(1 - 6x^2y)\,dxdy$$

24. Compute the first order differential equation

$$\frac{dy}{dx} = x + t$$

With initial condition x(0)=0

25. Compute the following transcendental equation using MATLAB:

$\sin x = e^x - 5$ here initial value x0=1.

26. Determine the convolution of x (t) =$\frac{1}{1+t^2}$with itself.

27. Compute the cross correlation between the following two sequences.

X(n)= {1,2, -1,3}, h(n)= {3, -2,1,4}

28. Let x (n)=u(n)-u(n-10). Decompose x(n) into even and odd components.

29. Let x (t)=$e^{-1000}|t|$

a) Sample x(t) at fs=5000 samples/sec to obtain x(n)

b) From the samples x(n), reconstruct x(t).

30. Using MATLAB symbolic math toolbox, determine the Laplace Transform of the following

a) x(t)=t$e^{-at}u(t)$

b) x(t) = [$\sin(at) + \cos(bt)(u(t))$

Course Outcomes:

CO 1. Learn various aspects of MATLAB such as interface, syntax, debugging and execution.

CO 2. Understand how various MATLAB scripts are created, saved and executed.

CO 3. Apply above knowledge in writing simple programs.

CO 4. Learn basic concepts of simulation using SIMULINK and write complex programs.

Evaluation criterion for NCC Cadets

Following criterion is proposed to be adopted for the evaluation of NCC cadets for the practical course of NCC/NSS/Yoga

A: Internal Evaluation (During semester):

(i) Attendance:	20 marks (for 90 % attendance full marks)
(ii) Discipline:	10 Marks
(iii) Drill performance & Body bearing:	10 marks
(iv) Participation in social activities:	10 marks
(v) Domain knowledge:	10 marks (Through oral viva)

B: End sem evaluation: (At the end of the semester)

(i) Discipline:	10 Marks
(ii) Drill performance & Body bearing:	15 marks
(iv) Domain knowledge:	15 marks (Through oral viva)

C: After end of the 6^{th} semester: Bonus marks 10 for each B & C certificate is proposed to be added in final marks subject to total marks does not exceed 100

NATIONAL CADET CORPS

INSTITUTIONAL TRAINING SYLLABUS

INTRODUCTION

1. Institutional Training being conducted in the Colleges and Schools is the principal means of training in the NCC. The aim of the training is to nurture core values, enhance awareness and give exposure to basic military skills and knowledge. Emphasis will be on practical training. Case studies, wherever possible will be used to facilitate active participation and better assimilation. Examples from India's freedom struggle and wars fought by India, post-independence, should supplement relevant subjects to generate secular and patriotic fervor. The instructors and the cadets must grasp the importance of this training and participate actively.

2. **Principles of Training:** In keeping with the changing environment, the principles of NCC Training are:
   (a) Junior Division (JD)/Junior Wing (JW) to be for two years while Senior Division (SD)/Senior Wing (SW) will be for three years.
   (b) Separate syllabi for JD/JW and SD/SW.
   (c) Modified, syllabus for professional educational institutes of repute to encourage enrolment of cadets.
   (d) Revised curriculum for training in a military environment with greater emphasis on soft skill development, awareness of social responsibilities and adventure and sports.
   (e) Uniformity in syllabus for boys and girls.
   (f) Common syllabus for all three wings to be approximately 60 to 70% and Specialised Service Syllabus training will be 30 to 40%.
   (g) Emphasis on practical training.
   (h) Conduct of periodic composite training ensuring continuity for better learning assimilation and its application.

3. Common subjects will comprise about 70% of the periods and Specilalised Service Subjects will be 30%. The breakdown of periods are as under:-

Sr. No.	Subject	No. of Periods			
		First Year	Second Year	Third Year	Total
Senior Division/Wing					
(a)	Common Subject	66	72	72	210
(b)	Specilised Subject	24	33	33	90
	Total	**90**	**105**	**105**	**300**

Junior Division/Wing

(c)	Common Subject	85	85		170
				--NA—	
(d)	Specialised Subject	35	35		70
	Total	**120**	**120**		**240**

4. In addition to this syllabus, **State Directorates** will conduct Social Service Activities in the form of rallies of any nature to carry social messages in the form of posters, street plays, placards etc.

Legend	
Abbreviation	Type
L	Lecture
D	Demonstration
DI	Discussion
P	Practice
V	Video

BLOCK SYLLABUS

COMMON SUBJECTS: SD/SW (ALL WINGS)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	The NCC	03	00	00	03
2.	National Integration and Awareness	06	06	06	18
3.	Drill	16	19	08	43
4.	Weapon Training	12	10	10	32
5.	Personality Development & Leadership	10	15	20	45
6.	Disaster Management	03	03	04	10
7.	Social Awareness & Community Development	05	05	06	16
8.	Health & Hygiene	05	04	07	16
9.	Adventure	02	06	07	15
10.	Environment Awareness and Conservation	02	02	02	06
11.	Obstacle Training	02	02	02	06
Total		**66**	**72**	**72**	**210**

BLOCK SYLLABUS

SPECIALISED SUBJECTS: SD/SW (ARMY)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	Armed Forces	04	04	02	10
2.	Map Reading	07	08	09	24
3.	Field Craft & Battle Craft	05	07	09	21
4.	Introduction to infantry Weapons & Equipment	02	04	05	11
5.	Military History	03	05	05	13
6.	Communication	03	05	03	11
Total		**24**	**33**	**33**	**90**

BLOCK SYLLABUS

SPECIALISED SUBJECTS: SD/SW (AIR)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	General Service Knowledge	02	02	02	06
2.	Air Compaigns	00	02	04	06
3.	Aircraft Recognition	00	04	00	04
4.	Modern Trends	00	00	02	02
5.	Principles of Flight	03	04	03	10
6.	Airmanship	06	02	02	10
7.	Navigation	00	03	02	05
8.	Meteorology	00	01	04	05
9.	Aero-Engines	01	04	01	06
10.	Airframes	02	02	02	06
11.	Instruments	02	03	02	07
12.	Aircraft Particulars	02	00	00	02
13.	Aeromodelling	06	06	09	21
Total		**24**	**33**	**33**	**90**

BLOCK SYLLABUS

SPECIALISED SUBJECTS: SD/SW (NAVY)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	Naval Orientation	08	06	03	17
2.	Naval Warfare and its Components	00	04	03	07
3.	Naval Communication	03	04	01	08
4.	Navigation	00	06	03	09
5.	Searmanship				
	(a) Anchor Work	01	01	00	02
	(b) Rigging	03	00	00	03
	(c) Boat Work	04	05	01	10
6.	Fire Fighting, Flodding and Damage Control	00	02	02	04
7.	Ship and Boat Modelling	02	03	14	19
8.	Search and Rescue	01	00	01	02
9.	Swimming	01	03	05	09
Total		**24**	**33**	**33**	**90**

Syllabus and Evaluation Scheme of Physical Education & Sports
Compulsory for up to B.Tech 6th Semester Students

Course Code: SWNC101	**L**	**T/P**	**C**
Course Title: Sports	**0**	**4**	**2**

Course Objective

Physical Education and Sports develop confidence, contributing to academic performance and mental health. Physical activity is a great way to relieve stress, promoting positive physical and mental health and enhanced learning aptitude. The class duration of 90 minutes will be divided into 02 segments comprising of Units 1 and 2.

- First 30 minutes of the class will be an interactive session where the students will be oriented and introduced to the different aspects of Physical Education and Sports.
- In the next 60 minutes of the class every students shall practice different skills and techniques of Athletics comprising of Track and Field events or any other specific games/sports of their choice.

Syllabus

Unit 1

Introduction to Physical Education

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education

Sports awards and honours

- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Olympic Movement

- Ancient & Modern Olympics (Summer & Winter)
- Olympic Symbols, Ideals, Objectives & Values

Physical Fitness, Wellness & Lifestyle

- Meaning & Importance of Physical Fitness
- Components of Physical fitness
- Components of Health related fitness Meaning & Importance of Wellness, Components of wellness
- Preventing Health Threats through Lifestyle Change
- Concept of Positive Lifestyle: Importance of Balance Diet etc.

Fundamentals of Anatomy & Physiology in Physical Education and Sports

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

Kinesiology, Biomechanics & Sports

- Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
- Biomechanical principles & its application in sports. (Laws of motion, Friction, Projectile etc.)

Postures

- Meaning and Concept of Postures.
- Causes of Bad Posture.
- Advantages & disadvantages of weight training.
- Concept & advantages of Correct Posture. Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis, Corrective Measures for Postural Deformities

Training and Planning in Sports

- Meaning of Training
- Warming up and limbering down
- Skill, Technique & Style

Psychology & Sports

- Definition & Importance of Psychology in Physical Edu. & Sports
- Define & Differentiate Between Growth & Development
- Adolescent Problems & Their Management
- Emotion: Concept, Type & Controlling of emotions
- Meaning, Concept & Types of Aggressions in Sports.

Doping

- Meaning and Concept of Doping
- Prohibited Substances & Methods
- Side Effects of Prohibited Substances

Sports Medicine

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention and Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

Unit-2

(Practical-Sports Specific) Each student has to compulsorily opt for one game/sport so that he/she can be assessed on their performance in the same accordingly for all the 03 years.

Each student will be given practical knowledge about the basic fundamentals of various games and sports and Athletic Events be it Track or Field thereby developing the skill.

Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball etc.

1. History of the Game/Sport.
2. Latest General Rules of the Game/Sport.
3. Specifications of Play Fields and Related Sports Equipment.
4. Important Tournaments and Venues.
5. Sports Personalities.
6. Proper Sports Gear and its Importance

REFERENCE BOOKS:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Health and Physical Education – NCERT

Distribution of Marks: Total 100 (10+30+20+40)

1. Class Attendance / Punctuality –	10 marks
2. Active Participation Sports Related Activities - (CITIUS, RUN FOR Unity, Prabhat Pheri etc.)	30 marks
3. Viva/Subject Knowledge-	20 marks
4. Practical Exam at the end of 6th Sem (Modified Fitness Test)-	40 marks

Note – PWD Students will be exempted from taking part in physical activities and the Modified Physical Fitness Test.

Syllabus and Evaluation Scheme of Yog
Compulsory for up to B.Tech 6th Semester Students

Course Code: SWNC101	**L**	**T/P**	**C**
Course Title: Yoga	**0**	**4**	**2**

Introduction: Yog education in Institute can immensely contribute to health of children by disseminating knowledge and awareness about the value of health, inculcating and nurturing health promoting habits and life style.

Objectives of the course:

- To enable the student to have good physical and mental health.
- To improve cognitive ability.
- To improve the level of consciousness.

UNIT-I

Introduction to Yog

- Brief introduction to origin of Yog, Psychological aspects leading to origin of Yog, Hindu Mythological concepts about origin of Yog
- History and Development of Yog
- Etymology and Definitions of Yog, Aim and Objectives of Yog, Misconceptions about Yog, True Nature of Yog
- General Introduction to Schools of Yog
- Principles of Yog, Yog Practices for Health and Harmony

UNIT-II

Yog and You

- **Concept of Health-** Aahaar, Nidra, Bharmacharaya, Viyayaam.
- **Aarogya -** Prevention, Cure and Remedies.
- Life Management and Development.

UNIT-III

Yog for Health Promotion –

- Brief introduction to human body
- Role of yog for health promotion
- Yogic attitudes and practices
- Holistic approach of yog towards the health and diseases
- Introduction to yog diet and its relevance and importance in yog Sadhana
- Dincharya and Ritucharya with respect of yogic lifestyle

UNIT-IV

Yog as Preventive measure for Lifestyle Disease

- **Obesity:** Procedure, Benefits & Contraindications for Tadasana, Katichakrasana, Pavanmuktasana, Matsayasana, Halasana, Pachimottansana, Ardha – Matsyendrasana, Dhanurasana, Ushtrasana, Suryabedhan pranayama.
- **Diabetes:** Procedure, Benefits & Contraindications for Katichakrasana, Pavanmuktasana,Bhujangasana, Shalabhasana, Dhanurasana, Supta-vajarasana, Paschimottanasana, Ardha-Mastendrasana, Mandukasana, Gomukasana, Yogmudra, Ushtrasana, Kapalabhati.
- **Asthma:** Procedure, Benefits & Contraindications for Tadasana, Urdhwahastottansana, UttanMandukasana, Bhujangasana, Dhanurasana, Ushtrasana, Vakrasana, Kapalbhati, Gomukhasana Matsyaasana, Anuloma-Viloma.
- **Hypertension:** Procedure, Benefits & Contraindications for Tadasana, Katichakransan, Uttanpadasana, Ardha Halasana, Sarala Matyasana, Gomukhasana,

UttanMandukasana, Vakrasana, Bhujangasana, Makarasana, Shavasana, Nadishodhanapranayam, Sitlipranayam.

UNIT-V (Yogic Practice)

1. YOGIC SUKSMA VYAYAMA

Uccharana-sthalatatha Vishudha-chakra-shuddhi (for throat and voice)
Prarthana (Prayer)
Buddhi-tatha-dhritishakti-vikasaka (for developing will power)
Smaranashakti-vikasaka (for improving the memory)
Medhashakti-vikasaka (for improving the intellect and memory)
Netrashakti-vikasaka (for the eyes)
Kapolashakti-vardhaka (for the cheeks)
Karnashakti-vardhaka (for the ears)
Grivashakti-vikasaka (for the Neck)
Grivashakti-vikasaka (for the Neck)
Grivashakti-vikasaka (for the Neck)
Skandha-tatha-bahu-mulashakti-vikasaka (for the shoulders)
Bhuja-bandhashakti-vikasaka
Kohinishakti-vikasaka
Bhuja-vallishakti-vikasaka
Purna-bhujashakti-vikasaka (for the arms)
Mani-bandhashakti-vikasaka
Kara-prsthashakti-vikasaka
Kara-talashakti-vikasaka
Anguli-mulashakti-vikasaka (for the fingers)
Anguli- shakti-vikasaka (for the fingers)
Vaksa-sthalashakti-vikasaka (for the chest)
Vaksa-sthalashakti-vikasaka (for the chest)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarasakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
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Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Muladhara-chakra-suddhi (for the rectum)
Upasthatatha-svadhisthana-chakra-suddhi (for the genital organs)
Kundalinishakti-vikasaka (for the kundalini)
Janghashakti-vikasaka (for the thighs)
Janghashakti-vikasaka (for the thighs)
Janushakti-vikasaka (for the knees)
Pindalishakti-vikasaka (for the calves)
Pada-mulashakti-vikasaka
Gulpha-pada-pristha-pada-tala-shakti-vikasaka (for the ankles and the feet)
Padangulishakti-vikasaka (for the toes)

2. YOGSANA (Sitting Postures)

Dandasana, Swastikasana, Padmasana,Vajrasana, Supta Vajrasana**,** Kagasana, Utkatasana, Gomukhasana,Ushtrasana, Shashankasana, Janusirasana, Paschimottanasana, Bhramacharyasana, Mandukasana, Utthana Mandukasana, Vakrasana, Ardha Matsyendrasana, Marichayasana, Simhasana

3. **YOGSANA (Supine lying Postures)**

   Pavanamuktasan, Utthana-padasana, Ardha Halasana, Halasana, Setubandha Sarvangasana, Sarvangasana, Matsyasana, Chakrasana, Shavasana

4. **YOGSANA (Prone lying Postures)**

   Makarasana, Bhujangasana, Shalabhasana, Dhanurasana, Kapotasana, Raja Kapotasana

5. **PRANAYAMA (with Antar & Bahya Kumbhaka)**

   Surya-bhedi and Chandra-bhedi Pranayama, Ujjayi Pranayama, Sheetali Pranayama, Shitkari Pranayama, Bhastrika Pranayama

6. **BANDHA**

   Jivha Bandha, Jalandhara Bandha, Uddiyana Bandha, Mula Bandha, Maha Bandha, Tri Bandha

7. **PRACTICES LEADING TO MEDITATION**

   Ajapa Dharana, Yog Nidra, Practices leading to Breath Meditation, Practices leading to Om Meditation

8. **YOGSANA**

   Siddhasana, Bhadrasana, Baddha Padmasana, Uttitha Padmasana, Bhunamanasana, Hanumanasana, Bakasana, Kukkutasana, Garbhasana, Matsyendrasana, Marjariasana, Padangusthasana, Hastapadangusthasana, Garudasana, Vatayanasana, Natarajasana, Mayurasana, Padma Mayurasana, Sirshasana and its variations, Ekapada and Dwipada Kandarasana

9. **MUDRAS**

   Yog Mudra, Maha Mudra, Shanmukhi Mudra, Shambhavi Mudra, Kaki Mudra, Tadagi Mudra, Vipareet Karni Mudra, Simha Mudra

Distribution of Marks: Total 100 (10+30+20+40)

1. Class Attendance / Punctuality –	**10 marks**
2. Active Participation in Sports Related Activities -	**30 marks**
3. Viva/Subject Knowledge-	**20 marks**
4. End Semester Practical Exam (Yogic Practice)-	**40 marks**

National Service Scheme (NSS)

Course Title: NCC/NSS/Yoga | Course Code: SWNC102;

LTP: 002 | Credit: 1 (Semester 1 to 6)

Overall Objective:

Development of Student's personality through community service.

Aims & Objective of NSS:

i. To understand the community in which they work.

ii. To understand themselves in relation to their community.

iii. To identify the needs and problems of the community and involve them in a problem-solving process.

iv. To develop among themselves a sense of social and civic responsibility.

v. To utilize their knowledge in finding practical solutions to individual and community problems.

vi. To develop the competence required for group living and sharing responsibilities.

vii. To gain skills in mobilizing community participation.

viii. To acquire leadership qualities and a democratic attitude.

ix. To develop capacity to meet emergencies and natural disasters.

Joining NSS:

Simply by enrolling/registering yourself in the NSS unit through the NSS Programme Coordinator/Officer concerned.

Guidelines for Evaluating NSS Students

Curriculum's 1-credit Course (Semester 1 to 6)

For the curriculum's credit award to students under NSS, the following procedure will be adopted:

Students should engage in various NSS activities (listed in Annexure-1) for at least 240 hours in three years (minimum 40 Hrs/semester).

The attendance records of students will be maintained by their unit's respective Programme Officer.

A student who participates in different activities of NSS during the 1st to 6th semester then he/she will earn certain hours per activity depending upon his/her role and responsibilities carried out by the volunteer as per the following rules:

S.No.	Role	No. of Hours
1	Audience	Upto 5 Hours
2	Active Participation	Upto 7 Hours
3	Organizer	Upto 10 Hours

Distribution of Marks: Total 100 (20+20+20+40)

Class Attendance: 20

Discipline & Punctuality: 20

Event Knowledge: 20

Comprehensive Viva (for all activities held during the entire semester): 40

Annexure-1 (Tentative NSS Activities Planned for an Academic Year)

Activities
Vanmohotsava Week (5-7 days) (Environment Enrichment & Tree Plantation) (Nearby places like public institutions, adopted villages/slum areas, and wasteland and other such activities)
Disaster Management (Workshops, awareness camps for Relief and rescue work inoculation and immunization, distribution of medicines, essential goods)
Adopted village (visiting some nearby villages and deciding 2-3 villages to be adopted for literacy promotion and basic facilities like drinking water, pucca/kutchha road, school shed/buildings, cooperative/self-employment scheme, etc.)
Independence Day (Participation in the college celebration)
Literacy Week (Pledge-taking ceremony, Visit to adopted village/slum to organize dialogue and discussion, Putting up hoardings and banners at prominent places in the local area)
Health Service & Awareness (Integrated Child Development Programme, Health Education, HIV/AIDS Awareness Programme, Motivating parents to send children to school and other such activities)
"**Annual NSS Day Celebrations**" of NSS
Digital Transactions Awareness Programs ("Startup India – Stand up India")
Blood Donation Camp in collaboration with NITKAA
Autumn Camp (**4-6 days)** in a nearby village (Youth for Sustainable Development with a focus on Watershed Management & Wasteland Development or some other theme)
Gandhi Jayanti (Quiz competition, Speech, Communal Harmony DAY, and other such activities)
Quami Ekta Week (National Integration Day, Welfare of Minorities Day, Cultural Unity Day, Women's Day, Conservation Day)
Swachhta Pakhwada (various activities like cleanliness campaigns in campus, locality, road safety, and other such activities engaging GOI Ministries/Departments initiatives)
Legal Literacy-Social Justice (Lecture by relevant person and other activities
World AIDS Day (creating awareness among school and college-going students, organizing lectures, public discussions, film shows, rallies and street plays)
Energy Conservation Day (awareness programme and other activities

National Youth Week (Lectures/Symposia on the philosophy and teaching of Swami Vivekanand, Mahatma Gandhi; Debate on the role of youth in the contemporary situation; Essay/drawing competitions amongst youth)
Republic Day (Participation in the college celebration)
Nasha Mukti Abhiyan (Awareness on the part of Tobacco Free Society; campaigns, posters, programmes in Hostels)
Women's Week (Special programmes regarding the significant role of women and girl child; Prominent women leaders lectures; awareness programmes and other such activities)
National Safety Day/ Week (Activities based on a theme provided by National Safety Council (GOI))
Life Skills and Vocational Training Programmes (Industry professional for lectures, competitions and other such activities)
Career Guidance (For college students through prominent speakers; NSS volunteers going to schools to provide guidance to 9-12th students and other such activities)
Environment Enrichment & Climate Change (Special programmes like lectures, campaigns, posters and other such activities)
World Bicycle Day Celebration
Other Activities: Activities suggested by Institute, State NSS Unit, MHRD, GOI Ministries etc.

Guidelines for evaluation of student activities under Students Clubs
(1st to 6th Semester: 02 credit)

The Students Clubs provide facilities and the right environment to develop extra-curricular skills in the students, in addition to the academic knowledge imparted by the Institute. Twelve (12) different clubs are working under Students Clubs which organized various events (workshops, guest lecturers etc.) and competitions, to instil the spirit of healthy competition among students, throughout the year. A national level mega cultural festival under the name CONFLUENCE is organized every year. Students can earn course credit by participating in various events organised by the student's club and assisting in coordinating these events as a member of these clubs.

For the credit award to students under students club, following is recommended:

1. Students must engage in club activities for 240 hours in three years (40 hours in one semester).
2. The evaluation criterion and activity hours will be calculated as follows:

SNo	Evaluation Criterion	Number of hours credited	Distribution of Max Marks 100 (Weightage 80%)
1.	Participation as an Audience	0.5 hour* number of event hours	--
2.	Participation as an Performer	(a) 06 hours for full day activity (b) 03 hours for half day activity	10 05
3.	Prize/Award/Recognition (intra - college events)	05 hours	20
4.	Prize/Award/Recognition (inter - college events)	10 hours	30
5.	Organization of event	(a) 12 hours for full day activity (b) 06 hours for half day activity	20 10
6.	Sponsorship Note: Number of hours will be equally divided among students involved where minimum Rs. 25,000/- per students must be ensured.	(a) 15 hours for sponsorship upto 01 Lakh (b) 30 hours for sponsorship upto 05 Lakh (c) 40 hours for sponsorship more than 05 Lakh	(a) 15 (b) 30 (c) 40 Note: Marks will be divided equally in team members, if any

3. The comprehensive viva-voce (**Weightage 20%**) will be conducted at the end of every semester.
4. Documents required as proof:

a. **Participation**: A certificate of participation duly signed by the organizing club's faculty-in-charge. All clubs will maintain a record of certificates issued for verification.
b. **Prize/Reward/Recognition**: A Certificate of Merit/Letter of Appreciation duly signed by Head of the Institute/Dean (SW)/Professor-in-charge of Students Club.
c. **Organization**: A Certificate of Appreciation mentioning event's name and committee's name in which the student contributed.
d. **Sponsorship**: A letter of sponsorship from sponsoring organization mention amount and list of students involved in sponsorship effort. The amount will be equally divided among the students for award of hours and marks as per criterion 6.

Note:

1. Faculty in charges of the individual clubs must ensure at least 40 hours of activities per semester and must keep the record of number of hours for each and every student involved/ registered for clubs.
2. Further, workload of two (02) hours per week should be included as teaching load for faculty in-charges (FIC) and Professor In-charges (PIC) in order to ensure smooth conduct of activities of the clubs.
3. It is recommended to make provision for earned leave for organising events in non-working days.

Guidelines for evaluation of student activities under Technical Societies
(Semester 1st to 6th: 240 hrs.: 1 credit)

There are 12 societies/clubs currently under technical societies which conduct various events (competitions, workshops, guest lectures, meetings etc.) throughout the year and one major event TECHSPARDHA, the annual technical festival is conducted once a year. Each of this society/club is headed by a team of students usually from final year of their programme under the guidance of a faculty-in-charge.

Under new curriculum for B. Tech students, the activities of all technical societies/clubs are to be considered as an audit course. The credit for this course will be awarded at the end of 6th semester.

Students can earn course credit by participating in various events organised by the technical societies and help in coordinating these events as a member of these societies/clubs. The selected heads of societies/clubs under supervision of faculty-in-charge will ensure that each member is engaged in the activities of society/club for at least 40 hours in each semester (240 hours in 6 semesters) to fulfil the requirement of award of credits

At the end of sixth semester the evaluation of student will be carried by a committee of faculty-in-charges of the technical societies. They will be awarded points on following criterion:

Sr. No.	Criterion	Semester I and II (max 20 marks)	Semester III and IV (max 30 marks)	Semester V and VI (max 50 marks)
1.	Participation	1/event	1.5/event	2/event
2.	Prize/Award/ Recognition (intra-college events)	2/event	3/event	4/event
3.	Prize/Award/ Recognition (inter-college events)	4/event	6/event	8/event
4.	Organization	4/event	6/event	8/event
5.	Sponsorship	4/ (Rs10K worth of sponsorship individually)	6/ (Rs20K worth of sponsorship individually)	8/ (Rs40K worth of sponsorship individually)

The committee will duly verify the credentials of each candidate and award marks on above criterion. Student will be awarded a grade as per institute norms.

Documents required as proof:

a. Participation: A certificate of participation duly signed by the organizing club's faculty-in-charge. All societies/clubs to maintain a record of certificates issued for verification.
b. Prize/Reward/Recognition: A Certificate of Merit/Letter of Appreciation duly signed by Head of the Institute/Dean(R&C)/Professor-in-charge of Technical Societies.
c. Organization: A Certificate of Appreciation mentioning event's name and committee's name in which the student contributed, duly signed by the faculty-in-charge of the organizing club.
d. Sponsorship: A letter of sponsorship from sponsoring organization mention amount and list of students involved in sponsorship effort. The amount will be equally divided among the students for award of marks as per criterion 5.

Bearing in mind that the activities of clubs/societies are a part of curriculum now, following recommendation may kindly be considered:

1. Adequate space may be allocated to each society/club for conducting meeting, storing materials and equipment and keeping records.
2. Adequate staff and office space be provided to professor-in-charge (Technical Societies) keep track of purchases, maintain accounts and records and secretarial assistance.
3. An engagement of one hour per week in the load of faculty-in-charge be shown in timetable to compensate for time devoted to the activities of club/societies.

Course Code MAIC 204	Applied Linear Algebra (For ECE & IIOT)	L - T - P - 3 - 0 - 0 - 3

Pre-Requisites: MAIC 102Course Objective:

1. To introduce the application of linear algebra and matrices inthe different branches of mathematics.
2. To introduce theoretical aspects of linear algebra required forrecent evolving branches like machine learning and data analysis.
3. Extensively introduce students with generalized inverse, QR de-composition and SVD.
4. Introduces Perron–Frobenius theorem, Quadratic form. Sylvesterinertia theorem, Linear functional, Bilinear mapping.

Unit 1: **9L**

Vector spaces, Bases and dimensions, Sums and direct sums, Quo-tient spaces.

Unit 2: **9L**

Linear transformations, Kernel and Image of a linear transformation, Rank-nullity theorem, Representation of linear transformations by matrices, Change of bases for linear transformations, Bases-change Matrices, Orthonormal bases, Gram-Schmidt process.

Unit 3: **9L**

Invariant subspaces, Cayley-Hamilton theorem, Minimal polynomial, Adjoint operators (matrix), Normal, unitary, and self-adjoint opera- tors (matrix), Schur's Lemma, Spectral theorem for normal operators (matrix) (Unitary diagonalization, and triangulation of a matrix), Direct-sum decomposition, Cyclic subspaces, and Annihilators, Ra- tional and Jordan canonical forms, LU and Cholesky decomposition,Householder's Reflection, QR and Polar Decomposition.

Unit 4: **9L**

Tridiagonal Matrix, Strum's Sequence, Projection Matrix, Singu- lar value decomposition, Generalized inverse of the matrix, Per- ron–Frobenius theorem, Quadratic form. Sylvester inertia theorem, Linear functional, Bilinear mapping and inner product spaces.

Text Books:

1. K. Hoffman and R. A. Kunze, Linear Algebra, Prentice Hall ofIndia.
2. H. Dym, Linear algebra in Action (Graduate studies in Mathe-matics, American Mathematical Society.

Reference Books:

1. R A Horn, C R Johnson, Matrix Analysis, Cambridge.
2. J H Kwak, S Hong, Linear Algebra, Birkhauser.

Course Outcomes:

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

CO1	Understand the basic concepts of linear algebra related to stability, accuracy, etc.
CO2	Find QR factorization of a matrix using Householder transformation and study its applications.
CO3	Write various algorithms to solve system of linear equations to understand computational issues.
CO4	Describe the numerical procedure of eigenvalue problem.
CO5	Apply the SVD of a matrix in solving real life problems.

ECPC-209 ANALOG ELECTRONICS

Pre-requisite:PHIC-11, PHIC-13 and ECPC-201

L	T	P	Credits	Total contact hours
3+1	0	0	3	40

Brief Description of the Course:

To enable the students to design single and multistage amplifiers, oscillators and Op-Amp-based linear and non-linear circuits.

Course Content

UNIT I **10 hrs**

Analysis and design of the single-stage amplifier using MOS devices, estimation of voltage gain, input resistance, output resistance etc., Classification of amplifiers, Direct coupled amplifiers, Multistage amplifiers, and the Frequency response of amplifiers. Current Mirrors, Differential Amplifiers.

UNIT II **10 hrs**

Introduction to OP-AMP, ideal OP-AMP, equivalent circuit, transfer characteristics, Op-Amp with negative feedback, inverting and non-inverting amplifiers, frequency response, compensating network, circuit stability, and slew rate.

UNIT III **10 hrs**

OP-AMP applications: integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Operational Transconductance Amplifier, Active filters: Low pass, high pass, band pass and band stop, design guidelines.

UNIT IV **10 hrs**

Digital-to-analog converters (DAC), Analog-to-digital converters (ADC), Oscillators: Review the basic concept, Barkhausen criterion, RC oscillators, LC oscillators. Real-life applications: A case study.

Text Books / Reference

1. A. Sedra and C. Smith, Microelectronic Circuits: Theory and Applications, Oxford University Press, 6th Edition, 2013.
2. J. Millman and C. Halkias, Integrated Electronics, McGraw Hill, 2nd Edition, 2009.
3. Behzad Razavi, Design of analog CMOS Integrated circuits, McGraw Hill, 2002.
4. R. A. Gayakwaed, OP-amps and Linear Integrated circuits, Prentice Hall India Learning Private Limited, 4th Edition 2002.
5. K. R. Botkar, Integrated circuits, Khanna Publishers, 2004.

Course outcomes:

At the end of the course student will be able to
CO1: Design single and multistage amplifiers and current mirrors
CO2: Understand the characteristics of op-amps and circuit design based on op-amps.
CO3: Understand the use of op-amps in different types of applications.
CO4: Design ADC and DAC.

ECPC-210 DIGITAL COMMUNICATION

Pre-requisite: Communication Engineering (ECPC-205), Signals, Systems and Random variables (ECPC-203)

L	T	P	Credits	Total contact hours
3+1	0	0	3	40

Brief Description about the course:

The course on digital communication provides a foundation for design and analysis of various digital communication techniques. It contains the methods of baseband communication, their challenges and the techniques to overcome them. Various digital modulation techniques such as BPSK, DPSK, QPSK, MPSK, QAM, FSK, MFSK, MSK are introduced and their performance is analyzed. Some more recent techniques such as spread spectrum systems and multicarrier systems are introduced along with their applications in real world systems. The students will learn the concept of pulse shaping, methods of equalization, signal space representation, along with different passband digital communication techniques, their analysis and implementation.

COURSE OBIECTIVES:

To understand the key modules of digital communication systems with emphasis on digital modulation techniques; various aspects such as effect of Inter Symbol Interference, BER for different modulation techniques and bandwidth efficiency, and practical applications.

UNIT I **12 hrs**

BASE BAND PULSE TRANSMISSION: Matched filter and its properties average probability of symbol error in binary encoded PCM receiver, inter symbol interference, Nyquist criterion for distortion less base band binary transmission, ideal Nyquist channel raised cosine spectrum, correlative level coding Duo binary signaling, tapped delay line equalization, adaptive equalization, LMS algorithm, Eye pattern.

UNIT II **10 hrs**

SIGNAL SPACE ANALYSIS & OPTIMUM RECEIVER: Pass band transmission model; gram Schmidt orthogonalization procedure, geometric Interpretation of signals, Response of bank of correlators to noise input, detection of known signal in AWGN. Likelihood function, coherent detection of signals, maximum likelihood decoding, correlation receiver, matched filter receiver.

UNIT III **10 hrs**

DIGITAL MODULATION TECHNIQUES: BPSK, DPSK, QPSK, MPSK, QAM,, FSK, MFSK, MSK, modulation and demodulation schemes and their performance analysis, comparison of modulation schemes on the basis of probability of error and bandwidth efficiency, signal space diagram and spectra of the above modulation schemes.

UNIT IV **8 hrs**

SPREAD SPECTRUM AND MULTICARRIER CMMUNICATIONS: Pseudonoise sequence, principle of spread spectrum, direct sequence spread spectrum with coherent BPSK, signal, space dimensionality & processing gain, probability of error, frequency hopped spread spectrum, CDMA, Principles of OFDM, Cyclic prefix redundancy in OFDM, OFDM equalization, DMT system, applications of OFDM and DMT.

TEXTBOOKS

1. Simon Haykins, Communication Systems, Wiley & Sons, 4th Edition.
2. Taub & Schilling, Principles of Communication Systems, TMH.
3. B.P. Lathi , Modern Digital and Analog Communications, Oxford.
4. Proakis, Digital Communication.

Course outcomes:

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

CO 1. Understand the baseband binary data transmission system and the process of equalization
CO 2. Obtain the signal space representation for signals and analyse them.
CO 3. Understand and analyse various detection criteria for detection of signals
CO 4. Understand the principle of various digital modulation techniques
CO 5. Analyze the BER performance of digital modulation techniques.
CO 6. Understand principles of spread spectrum systems
CO 7. Understand the principles of DMT and OFDM systems and their practical applications.

ECPC-211 COMPUTER ARCHITECTURE

Pre-requisite: ECPC-202

L	T	P	Credits	Total contact hours
3+1	0	0	3	42

Brief Description of the course:

This course aims to provide a strong foundation for students to understand the modern eras of computer architecture (i.e., the single-core era, multi-core era, and accelerator era) and to apply these insights and principles to future computer designs.

UNIT I **8hrs**

INTRODUCTION TO COMPUTER HARDWARE AND SOFTWARE: Functional Units, Historical perspective, Performance of computer, Register transfer and micro-operations, Information representation, Instruction format, Instruction types, Addressing modes, Instruction set architectures- CISC and RISC, Super-scaler architecture, Fixed point and floating point operations.

UNIT II **12hrs**

BASIC PROCESSING UNIT & MEMORY ORGANIZATION: Fundamental concepts, ALU, Control unit, Multiple bus organization, Hardwired control, Micro programmed control, Semiconductor RAM memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance considerations, Cache Coherency in Multiprocessor, Virtual Memories, Memory Management Requirements, Secondary Storage devices.

UNIT III **12hrs**

PILELINE AND VECTOR PROCESSING: Parallel processing, Pipelining, Hazards, CISC & RISC pipeline, Vector processing. Array processing.

I/O ORGANIZATION: Accessing I/O Devices, Programmed I/O, Interrupt-driven I/O, Direct Memory Access, Buses, Interface Circuits: Serial port, Parallel port, PCI Bus, SCSI Bus, USB, The External Interface-FireWire and InfiniBand.

UNIT IV **10hrs**

ADVANCED COMPUTER ARCHITECTURE: Study of instruction set design, parallel processing, bit, instruction, and data level parallelism, distributed computing, virtualization architecture, AI/ML applications and cloud and mobile architecture.

Case Study: MIPS processor architecture. Computer architecture for sustainable computer systems. Future Trends in Computer Architecture Research.

Reference Books:

1. C. Hamacher, Z. Vranesic and S. Zaky, Computer Organization, McGraw-Hill, 5th ed., 2002.
2. W. Stallings, Computer Organization and Architecture - Designing for Performance, Pearson, 7th ed.,2006.
3. M.M. Mano, Computer System Architecture, PHI.
4. J. P. Hayes, Computer Architecture and Organization, McGraw-Hill.
5. John L. Hennessy, David A. Patterson, Computer Architecture - A Quantitative Approach, 5th edition.

Course outcomes:

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

CO1: Comprehend the basic knowledge of functional components of computer systems.

CO2: Analyze concept of various addressing modes including design instruction set architecture. Identify the function of building blocks within CPU of a computer system.

CO3: Explain memory system design including Cache and Virtual-memory systems. Familiarize with the basic knowledge of I/O devices and interface circuits.

CO4: Identify problems and understand parallel programming models of multicore processors, multiprocessors.

ECPC-212 INFORMATION THEORY AND CODING

Pre-requisite: Communication Engineering (ECPC-205), Signals, Systems and Random variables (ECPC-203)

L	T	P	Credits	Total contact hours
3	0	0	3	40

Brief Description about the course:

Information theory and coding deals with the concept of information content in a digital message and techniques to efficiently represent them by using source coding methods. The channel coding techniques aim at providing reliable digital communication of message signal over noisy channels. The course contains Shannon's fundamental theorems on coding, necessary mathematical background for various error correction codes, construction and detection of linear block codes, cyclic codes, and convolutional codes. The students will learn how to use the source coding techniques to remove the redundancy from the message and then design suitable channel codes for use at transmitter and decode them at the receiver to ensure error free transmission of message signal.

Course Learning Objectives

To understand elements of information theory and source coding, Linear block codes, Cyclic codes, Convolutional codes and their applications.

Course Content

UNIT I **12 hrs**

ELEMENTS OF INFORMATION THEORY AND SOURCE CODING: Introduction, information as a measure of uncertainty, Entropy & its properties, Entropy of continuous sources, Discrete memoryless channels, Mutual information & its properties, BSC, BEC. Channel capacity, Shanon's theorem on coding for memoryless noisy channels, Shanon's three fundamental theorems.
Separable binary codes, Shanon–Fano encoding, Noiseless coding, Theorem of decodability, Average length of encoded message, Shanon's binary encoding, Fundamental theorem of discrete noiseless coding, Huffman's minimum redundancy codes, capacity of colored noise source, water filling algorithms.

UNIT II **12hrs**

LINEAR BLOCK CODES: Groups & fields, Galois fields & its construction, Minimal polynomial, Vector spaces, Dual spaces, Linear block codes, Syndrome & error detections, Minimum distance, Error detecting and correcting capabilities of a block code, Standard array & Syndrome decoding, Hamming code.

UNIT III **8 hrs**

CYCLIC CODES: Description of cyclic codes, Polynomial representation, Minimum degree code polynomial, Generator polynomial, Generator matrix, Systematic form, Parity check matrices, cyclic codes encoders, Syndrome computation and error detection, Cyclic Hamming codes, Decoding of cyclic codes.

UNIT IV **8hrs**

CONVOLUTIONAL CODES: Encoding of Convolution codes, Structural properties of Convolution codes, State diagram, Code tree, Trellis diagram, Free distance, Coding gain, Viterbi decoding, distance properties of binary convolutional codes, Burst error correcting convolutional codes.
Implementation of error control codes in real systems and case studies.

Reference Books:

1. F. M. Reza, Information Theory, McGraw Hill, 1st Ed.
2. Das, Mullick and Chatterjee, Digital Communication, Wiley Eastern Ltd, 3rd Ed..
3. Shu Lin and J. Costello, Error Control Coding, Prentice Hall, 3rd Ed..

Course outcomes:

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

CO 1. Understand the concepts of Random variables and stochastic processes and their applications in communication engineering.

CO 2. To be able to perform the time and frequency domain analysis of the signals in a digital communication system.

CO 3. Understand and apply the Entropy function, source coding and the three Shannon's fundamental theorems.

CO 4. Design the linear block codes and cyclic codes.

CO 5. Understand and apply the convolutions codes state diagrams, code tree and trellis diagrams, decoding algorithms.

CO 6. Understand and evaluate the channel performance using Information theory.

ECPC-213 ELECTRONICS –II LAB

Pre-requisite: ECPC-201and ECPC-209

L	T	P	Credits	Total contact hours
-	-	2	1	20

Brief description about the course

The purpose of this course is to familiarize the students about the practical implementation of single and multistage amplifiers, oscillators and Op-Amp-based linear and non-linear circuits. The basic objective is to familiarize students with the working principle of single stage and multistage amplifiers and their frequency response, & to demonstrate students with the designing of basic current mirrors, differential amplifier and Op-amp using MOSFETs.

List of Experiments:

1. Design a single stage RC Coupled Amplifier and plot it's gain frequency response.
2. Design a double stage RC Coupled Amplifier and Plot it's gain frequency response.
3. Design a RC phase shift oscillator using IC- 741.
4. Design a Wein Bridge oscillator using IC- 741.
5. Design a Voltage to Current Converter and Current to Voltage Converter using IC- 741.
6. To study various Wave Shaping circuits (clipper, clamper) using IC-741.
7. To design and test the performance of integrator and differentiator circuit using op – amp (IC-741).
8. To design first order Active Low Pass and High Pass filters using OP-Amp IC-741 for a given cut off frequency.
9. Introduction to LT-Spice design software and Study of MOSFET Characteristics using LT-Spice.
10. Design and Analysis of single stage common source amplifier in LT-Spice.

Course Outcomes:

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

CO1: To Design &analyze a single stage, double stage for RC Coupled Amplifier and plot it's gain frequency response.
CO2: To Design &analyze oscillators using IC- 741.
CO3: To Design &analyze various Wave Shaping circuits (clipper, clamper) using IC-741.
CO4: To design and test the performance of integrator and differentiator circuit using op – amp (IC-741).
CO5: To design first order Active Low Pass and High Pass filters using OP-Amp IC-741 for a given cut off frequency

ECPC-214 COMMUNICATION ENGINEERING LAB

Pre-requisite: Communication Engineering (ECPC-205)

L	T	P	Credits	Total contact hours
-	-	2	1	20

Brief description about the course

The purpose of this course is to familiarize the students about the practical implementation of modulation and demodulation of analog communication schemes, pulse modulation and the waveforms associated.

List of Experiments:

1. To generate an Amplitude Modulated waveform with given modulation index and perform Demodulation.
2. To generate a Frequency Modulated waveform and study its modulation index and perform Demodulation.
3. To study Delta Modulation and Demodulation.
4. To study Adaptive Delta Modulation and Demodulation.
5. To study Pulse Amplitude Modulation and Demodulation.
6. To study Pulse Width Modulation and Demodulation.
7. To study Pulse Position Modulation and Demodulation.
8. To study Diode Detector.
9. To study AGC.
10. To study the selectivity of Superheterodyne Receiver

Course Outcomes:

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

CO1: Understand the basic hardware components used for modulation and demodulation schemes of analog communication.

CO2: Design and Implementation of the different types of modulation schemes.

CO3: Understand the waveforms associated with the different types of modulation schemes.

CO4: Learn about the use of Superheterodyne receiver.

ECPC-215 DIGITAL COMMUNICATION LAB

Pre-requisite: Communication Engineering (ECPC-205), Digital Communication (ECPC-210)

L	T	P	Credits	Total contact hours
-	-	2	1	20

Brief description about the course

The purpose of this course is to familiarize the students about the modulation and demodulation schemes of digital communication and understand the types of waveforms associated.

List of Experiments:

1. Verification of sampling theorem.
2. To study PSK modulation and demodulation.
3. To study FSK modulation and demodulation.
4. To study ASK modulation and demodulation.
5. To study PCM modulation and demodulation.
6. To study DPSK modulation and demodulation.
7. To study DQPSK modulation and demodulation.
8. To study TDM amplitude modulation and demodulation.
9. To study BPSK using Simulink
10. To study QPSK and its constellation diagram in MATLAB

Course Outcomes:

At the end of the course, students will be able to:
CO1: Understand the sampling theorem.
CO2: Understand the basic hardware components used for digital modulation schemes
CO3: Learn the modulation and demodulation of different types of digital communication schemes.
CO4: Understand the waveforms associated with the different types of digital modulation schemes.
CO5: Learn about the constellation diagram of QPSK and other digital modulation schemes in MATLAB.

CSLR-XXX
ECPC216-OBJECT ORIENTED PROGRAMMING LAB

Pre-requisite: CSIC-13

L	T	P	Credits	Total contact hours
-	-	2	1	20

Brief description about the course

This lab aims to get understanding of the basic concepts in object-oriented programming including encapsulation, abstraction, inheritance, and polymorphism. The student will design, implement, test, and debug programs to solve real-world problems in object-oriented programming languages (C++ and Java). Further, this course is dedicated to enhance the programming skills of the students by giving practical assignments and also requisite knowledge about Object Oriented Programming through C++ and Java to develop Applications/Projects.

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List of Experiments:

11. To understand the programming using structure.
12. To study the object and classes in object-oriented programming.
13. To understand the concept of array of objects.
14. To study the concepts of friend functions, inline functions, and function overloading.
15. To study different types of constructors with destructors.
16. To study Stack, Queue, Array, and Operator overloading.
17. To study dynamic memory allocation based on new and delete operators.
18. To study inheritance.
19. Implement the concepts of abstract class and virtual functions in C++.
20. To study exception handling and file handling in C++.
21. To study Java programs.
22. To design a graphical user interface (GUI) in Java.

Course Outcomes:

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

CO1: Gain knowledge and understanding of object-oriented programming concepts.
CO2: Analyze and apply the generic classes concepts in programming problem.
CO3: Apply the object-oriented programming concepts as and when required in the application development.
CO4: Implement patterns involving dynamic binding and utilization of polymorphism.
CO5: Understanding of Java packages for GUI development.