NOIDA INTERNATIONAL UNIVERSITY

EVALUATION SCHEME & SYLLABUS

For

UNDERGRADUATE DEGREE COURSE

IN

ELECTRONICS & COMMUNICATION ENGINEERING

(Effective from the Session: 2020-21)

B. Tech in Electronics and Communication Engineering

Program Educational Objectives (PEOs)

The Department of Electronics and Communication Engineering has developed and maintained a well-defined set of educational objectives and desired program outcomes. Educational objectives of the program cater to the requirements of the stakeholders such as students, parents, employers, alumni, faculty etc. The program educational objectives are as follows:

- **PEO**1: Provide graduates with a strong foundation in mathematics, science and engineering fundamentals to enable them to devise and deliver efficient solutions to challenging problems in Electronics, Communications and allied disciplines.
- **PEO**2: Impart analytic and thinking skills to develop initiatives and innovative ideas for R&D, Industry and societal requirements.
- **PEO**3: Provide sound theoretical and practical knowledge of E&C Engineering, managerial and entrepreneurial skills to enable students to contribute to the well-being of society with a global outlook.
- **PEO**4: Inculcate qualities of teamwork as well as social, interpersonal and leadership skills and an ability to adapt to evolving professional environments in the domains of engineering and technology.
- **PEO**5: Motivate graduates to become good human beings and responsible citizens for the overall welfare of the society.

Program outcomes (POs)

Engineering Graduates will be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12**. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of B.Tech. ECE program, graduates will be able to:
PSO1.
To identify the engineering problems and develop solutions in the area of communication, signal processing, VLSI and embedded systems.
PSO2.
To demonstrate proficiency in utilization of software and hardware tools along with analytical skills to arrive at appropriate solutions
PSO3.
Incorporate the socio-responsible electronics and communication engineer with leadership, teamwork skills and exhibit a commitment to the lifelong learning.

Credit Distribution

Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week 1 Hours Practical(Lab)/week	0.5 credits 1 credit

Range of credits:

A range of credits from 150 to 160 for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honors, if he/she completes an additional 20 credits. These could be acquired through MOOCs.

Course code and definition

Course code	Definitions
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
MC	Mandatory Course
OE	Open Elective
EC	Program Core
ECEL	Program Elective

Structure of Undergraduate Engineering program:

S.no	Category	Credits
1	Humanities and Social Sciences including Management courses	12
2	Basic Science courses	26
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	20
4	Professional core courses	51
5	Professional Elective courses relevant to chosen specialization/branch	21
6	Open subjects – Electives from other technical and /or emerging subjects	12
7	Project work, seminar and internship in industry or elsewhere	14
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	Non-credit
Total		**156**

THIRD SEMESTER											
S. No	**Course Code**	**Subject**	**Period**			**Evaluation Scheme**					**Total Credit**
						Sessional Exam			**End Exams**	**Sub total**	
			L	**T**	**P**	**CA**	**TA**	**Total**			
1	EC01	Electronic Devices	3	0	0	20	20	40	60	100	3
2	EC03	Digital System Design	3	0	0	20	20	40	60	100	3
3	EC05	Signals & Systems	3	0	0	20	20	40	60	100	3
4	EC06	Network Theory	3	0	0	20	20	40	60	100	3
5	BSC201	Mathematics -III	3	1	0	20	20	40	60	100	4
6	ESC201	Engineering Mechanics	3	1	0	20	20	40	60	100	4
7	HSMC201	Human Psychology	3	0	0	20	20	40	60	100	3
8		Online courses, NPTEL for Honors degree									
PRACTICALS											
1	EC02	Electronic Devices Lab	0	0	2	20	20	40	60	100	1
2	EC04	Digital System Design Lab	0	0	2	20	20	40	60	100	1
Total											**25**

FORTH SEMESTER											
S. No	**Course Code**	**Subject**	**Period**			**Evaluation Scheme**					**Total Credits**
						Sessional Exam			**ESE**	**Sub Total**	
			L	**T**	**P**	**CA**	**TA**	**Total**			
THEORY											
1	EC07	Analog and Digital Communication	3	0	0	20	20	40	60	100	3
2	EC09	Analog Electronics	3	0	0	20	20	40	60	100	3
3	EC11	Microcontrollers	3	0	0	20	20	40	60	100	3
4	BSC202	Biology-I	3	0	0	20	20	40	60	100	3
5	HSMC202	Human values	3	0	0	20	20	40	60	100	3
6	MC02	Python	3	0	2	20	20	40	60	100	0
7		Online courses, NPTEL for Honors degree									
PRACTICALS											
1	EC08	Analog and Digital Communication Lab	0	0	2	0	0	40	60	100	1
2	EC10	Analog Electronics lab	0	0	2	0	0	40	60	100	1
3	EC12	Microcontrollers Lab	0	0	2	0	0	40	60	100	1
Total											**18**

DETAILED CURRICULUM CONTENTS

Undergraduate Degree

In

Engineering & Technology

BRANCH: Electronics & Communication Engineering

SEMESTER -3

Course Code: EC01 **Course Name: Electronic Devices**
Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

- To understand basic semiconductor properties and hence improvement in future design consideration.
- To analyze different types of current in semiconductor.
- To understand characteristics of Transistor and MOS and other devices.
- To have an understanding of Integrated circuit fabrication process.

Course Description:

This course explores the theory and principles of electronic devices. Special attention is devoted to topics Semiconductor Physics, Generation and recombination, Bipolar Junction Transistor, MOS transistor, Integrated circuit fabrication process.

Course Contents:

UNIT 1

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors

UNIT 2

Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode

UNIT 3

Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell;

UNIT 4

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Course Learning Outcomes(CLOs) :

At the end of this course students will demonstrate the ability to

- Understand the principles of semiconductor Physics
- Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

Text books:

- G. Streetman, and S. K. Banerjee, ―Solid State Electronic Devices,‖ 7th edition, Pearson,2014.
- D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education.

Reference books:

- S. M. Sze and K. N. Kwok, ―Physics of Semiconductor Devices,‖ 3rd edition, John Wiley &Sons, 2006.
- C.T. Sah, ―Fundamentals of solid state electronics,‖ World Scientific Publishing Co. Inc, 1991.
- Y. Tsividis and M. Colin, ―Operation and Modeling of the MOS Transistor,‖ Oxford Univ.Press, 2011.

Online links for study & reference materials:

https://nptel.ac.in/courses/117/103/117103063/

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: EC03 **Course Name:** Digital System Design

Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

- To understand number representation and conversion between different representation in digital electronic circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand characteristics of memory and their classification.
- To understand concepts of sequential circuits and to analyze sequential systems.

Course Description:

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC technology. Then they are exposed to both combinational logic network and combinational MSI logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counter and shift register will be taught. The memory devices are introduced. Finally the use of HDL is briefed.

Course Contents:

Unit 1

Logic Simplification: Review of Boolean algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

Unit 2

Combinational Logic Design: MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU

Unit 3

Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation

Unit 4

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices.

Unit 5

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

Course Learning Outcomes (CLOs) :

At the end of this course students will demonstrate the ability to

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.

- Use HDL & appropriate EDA tools for digital logic design and simulation
- Be able to use PLDs to implement the given logical problem.

Text books:

- Moris Mano, ‒Digital Logic and Computer Design‖, PHI Publications, 2002
- R. P. Jain, ―Modern Digital Electronics‖, TMH, 3rd Edition, 2003.

Reference books:

- Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
- R.L. Tokheim, ‒Digital Electronics, Principles and Applications‖, Tata McGraw Hill, 1999.
- W. Gothman, ‒Digital electronics‖, PHI.
- S. Salivahanan & S. Arivyhgan. ‒Digital circuits and design‖, Vikas Publication, 2001
- Malvino Leach, "Digital Principles and Application", TMH, 1999.
- V. Rajaraman : Computer Fundamentals (PHI)

Online links for study & reference materials:

https://nptel.ac.in/courses/117/106/117106086/

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: EC05 **Course Name: Signals and System**
Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

- Understanding the fundamental characteristics of signals and systems.
- Understanding the concepts of vector space, inner product space and orthogonal series.
- Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
- Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

Course Description:

This course covers the fundamentals of signal and system analysis, focusing on representations of discrete-time and continuous-time signals (singularity functions, complex exponentials and geometrics, Fourier representations, Laplace and Z transforms, sampling) and representations of linear, time-invariant systems (difference and differential equations, block diagrams, system functions, poles and zeros, convolution, impulse and step responses, frequency responses). Applications are drawn broadly from engineering and physics, including feedback and control, communications, and signal processing.

Course Content:-

Unit 1

Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

Unit 2

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations. Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response,

Unit 3

Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases,

Unit 4

The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.

Unit 5

The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.

Unit 6

State-space analysis and multi- input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals.

Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.

Course Learning Outcomes(CLO):-

At the end of this course students will demonstrate the ability to

- CO1: Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.
- CO2: Analyse the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.
- CO3: Classify systems based on their properties and determine the response of LSI system using convolution.
- CO4: Analyze system properties based on impulse response and Fourier analysis.
- CO5: Apply the Laplace transform and Z- transform for analyze of continuous-time and discrete-time signals and systems.
- CO6: Understand the process of sampling and the effects of under sampling.

Text books:

- A.Anand Kumar, "Signals and Systems", Second edition, PHI Learning Private Limited,2012.
- A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.

Reference books:

- R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
- B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
- Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
- Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
- Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
- M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
- J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: EC06 **Course Name:** Network Theory
Course Credit Hour: 3hr **Total Contact Hour:** 40hr

Course Objective:

- To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques.
- To analyze circuits in time and frequency domain.
- To explain concepts of driving point and transfer functions, poles and zeroes of network functions and their stability.

Course Description:

The course begins with description of circuit elements & sources. Understanding of various interesting network theorems applied to solve linear, time invariant network problems efficiently in time and s-domain is discussed. Steady and transient solution of network problems with various sources including impulse source, representing a circuit in s-domain (Laplace domain).

Course Contents:

UNIT 1

Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits. Trigonometric and exponential

UNIT 2

Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

UNIT 3

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

UNIT 4

Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits,

UNIT 5

Introduction to band pass, low pass, high pass and band reject filters.

Course Learning Outcomes (CLOs):

- At the Understand basics electrical circuits with nodal and mesh analysis.
- Appreciate electrical network theorems.
- Apply Laplace Transform for steady state and transient analysis.
- Determine different network functions.

Text books:

- Van, Valkenburg.; ―Network analysis‖ ; Prentice hall of India, 2000
- Sudhakar, A., Shyammohan, S. P.―Circuits and Network‖; Tata McGraw-Hill New Delhi, 1994

Reference books:

- A William Hayt, –Engineering Circuit Analysis‖ 8th Edition, McGraw-Hill Education

Online links for study & reference materials:
https://nptel.ac.in/courses/108/105/108105159/#

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Mid exam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: BSC201 **Course Name:** Mathematics-III

Course Credit Hour: 4hr **Total Contact Hour:** 40hrs

Course Objective:

The main objective of this course is to provide students with the probabilistic and statistical analysis mostly used in varied applications in engineering and sciences and it provide the methods of organising and simplifying data so that their significance is comprehensible.

Course Description:

This course provides an introduction to probability and statistics with applications. Topics include: random variables, continuous and bivariate probability distributions, Bayesian inference, hypothesis testing, confidence intervals, curve fitting and regression.

Course Contents:

Unit 1: Basic Probability (12 hours)

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Unit 2: Continuous Probability Distributions (4 hours)

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Unit 3: Bivariate Distributions (4 hours)

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Unit 4: Basic Statistics (8 hours)

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Unit 5: Applied Statistics (8 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Unit 6: Small samples (4 hours)

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Course Learning Outcomes (CLOs):

- CLO-1: Recognize basic probability theory and its application.
- CLO-2: calculate Continuous Probability Distributions and their properties.
- CLO-3: Calculate bivariate distributions and their properties with applications.
- CLO-4: Basic concept of Statistics, Probability distribution and correlation.
- CLO-5: Fitting the data and large sample testing.
- CLO-6: Testing the hypothesis for Small samples

Text books:

- Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers
- S. Ross, ―A First Course in Probability‖, Pearson Education India,

Reference books:

- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,
- W. Feller, ―An Introduction to Probability Theory and its Applications‖, Wiley,

Online links for study & reference materials:

https://nptel.ac.in/courses/111/105/111105041/

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	- 04%
Assignment -2	- 04%
Assessment-3(Mid-Exam)	- 20%
Assignment-3	- 04%
Assignment-4	- 04%
Assignment-5	- 04%
Total Internal Assessment	**- 40%**

Course Code: ESC201 **Course Name:** Engineering Mechanics
Course Credit: 4 **Total Contact Hour:** 40hr

Course Objective:

- To make them learn the fundamentals of Mechanics, equation of static equilibrium & dynamic equilibrium of particles and rigid bodies
- To learn the effect of friction on equilibrium.
- To learn kinematics, kinetics of particle and rigid body, related principles.
- To implement the above know how to solve practical problems.

Course Description:

This course is an introduction to learning and applying the principles required to solve engineering mechanics problems. Concepts will be applied in this course from previous courses you have taken in basic math and physics. The course addresses the modeling and analysis of static equilibrium problems with an emphasis on real world engineering applications and problem solving.

Course Contents:

Unit 1

Force Vectors: Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton‘s laws and its completeness in describing particle motion; Form invariance of Newton‘s Second Law; Solving Newton‘s equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates.

Unit 2

Force System Resultant: Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler problem; Application.

Unit 3

Oscillation and Resonance: Non-inertial frames of reference; Rotating coordinate system: Five-term acceleration formula. Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum; Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance.

Unit 4

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler‘s laws of motion, their independence from Newton‘s laws, and their necessity in describing rigid body motion; Examples.

Unit 5

Moment of Inertia: Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed — only need to show that this motion looks two-dimensional but is three-dimensional, and two-dimensional formulation fails.

Course Learning Outcomes(CLOs) :

At the end of this course students will demonstrate the ability to

- Analyze and solve the practical problems of statics and dynamics.
- Take up the subjects like TOM, SOM, Design of machine elements, DOS, TOS etc.

Text books:

- Hibbeler, R.C., "Engineering Mechanics: statics", 12th edition, and Prentice Hall
- Beer, F.P. and Johnston, E.R. (2007) –Vector Mechanics for Engineers (Statics)‖, McGraw-Hill.

Reference books:

- MK Harbola –Engineering Mechanics‖, 2nd ed.
- MK Verma –Introduction to Mechanics‖
- D Kleppner & R Kolenkow An Introduction to Mechanics, 2001
- JL Synge & BA Griffiths —Principles of Mechanics‖ TMH, 1999.
- JL Meriam —Engineering Mechanics – Dynamics‖, 7th ed.

Online links for study & reference materials:

https://nptel.ac.in/courses/112/106/112106286/

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: **HSMC 201/301** **Course Name:** Human Psychology

Course Credit Hour: 3Hr **Total Contact Hour:** 30hr

Course Objective:

- The student will acquire knowledge of human psychology including workplace environment, Motivation and perception.

Course Description:

- This course introduces the fundamental of human psychology includes important insights about motivation, leadership, perception and work environment.

Course Contents:

Unit 1: Introduction to Psychology (8 lectures)

Definitions & Scope. Types and branches of psychology Major influence on Psychology- Scientific Management and Human relations -Hawthorne Experiments. Taylor Principles, Implications of Psychology on Modern Industries and behavior

Unit 2: Individual at workplace (8 lectures)

Attention and Perception, Individual at Workplace-Attitude, Motivation and Job satisfaction. Stress management. Leadership and Group dynamics.

Unit 3: Work Environment & Engineering Psychology- (7 lectures)

Engineering psychology: fatigue, Monotony, Boredom. Accidents and Safety. Emotional and social development, Cognitive development. Consumer behavior analysis.

Unit 4: Job Analysis (7 lectures)

Job Analysis, Recruitment, Selection and Interview– Reliability & Validity of recruitment tests. Performance Management: Training & Development, Appraisals.

Course Learning Outcomes (CLOs):

CLO-1: Develop the basic concept of human psychology.
CLO-2: Inculcate leadership and motivational skills.
CLO-3: To understand consumer behavior and emotional development.
CLO-4: To understand about job recruitment process and interviews methods.

Text books:

(i) Aamodt, M.G. (2007) Human/Organizational Psychology: An Applied Approach (5th edition) Wadsworth/Thompson: Belmont, C.A.

(ii) Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi: Tata McGraw Hill.

Reference books:

(i) Miner J.B. (1992) Organizational Psychology. N Y: McGraw Hill.

(ii) Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	- 05%
Assignment -2	- 05%
Assessment-3(Mid-Exam)	- 20%
Assignment-3/Quiz-1	- 05%
Assignment-4	- 05%
Total Internal Assessment	**- 40%**

Electronic Devices Lab

Teaching Scheme:- 0L:0T:2P **Paper Code: EC02**

Credits:1

1. To plot the V-I characteristics of junction tunnel & Schotky diode.
2. To plot the characteristics of P-N junction diode
3. To plot the C-V characteristics of P-N junction diode
4. To plot the halfwave & fullwave rectifier.
5. To plot the V-I Characteristics of zener diode.
6. To Study of zener diode as a voltage regulator.
7. To plot the input output characteristics of BJT in CB, CC, CE configuration.
8. To plot the input output characteristics of FET in CS Configuration.
9. To plot the optical (V-I) Characteristics of Photodiode.
10. To study the depletion mode & Enhancement mode MOSFET.

Digital System Design Lab

Teaching Scheme:- 0L: 0T: 2P **Paper Code: EC04**
Credits:1

1. Verification of NAND, NOR, Ex-OR,AND & OR Gates.
2. Implementation of half Adder & Full Adder
3. Implementation of half Subtractor & Full Subtractor.
4. Implementation of Demultiplexer / Decoder operation using IC-74138.
5. Implementation of Seven segment display.
6. Implementation of Binary to gray converter.
7. Implementation of Arithmetic algorithms.
8. Implementation of various flip-flops.
9. Implementation of Counters.
10. Implementation of shift register.
11. Verification of Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.

SEMESTER -4

Course Code:EC07 **Course Name:** Analog and Digital Communication
Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

- To understand basic elements of a communication system
- To conduct analysis of baseband signals in time domain and in frequency domain
- To demonstrate understanding of various analog and digital modulation and demodulation techniques techniques.
- To analyse the performance of modulation and demodulation techniques in various transmission environments

Course Description:

This course provides a thorough introduction to the basic principles and techniques used in analog and digital communications. The course will introduce analog and digital modulation techniques, communication receiver and transmitter design, baseband and bandpass communication techniques, line coding techniques, noise analysis, and multiplexing techniques. The course also introduces analytical techniques to evaluate the performance of communication systems.

Course Contents:

Unit 1

Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Unit 2

Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.

Unit 3

Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM),Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

Unit 4

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion, Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Unit 5

Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels-Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

Course Learning Outcomes(CLOs) :

At the end of this course students will demonstrate the ability to

- Analyze and compare different analog modulation schemes for their efficiency and bandwidth
- Analyze the behavior of a communication system in presence of noise
- Investigate pulsed modulation system and analyze their system performance
- Analyze different digital modulation schemes and can compute the bit error performance

Text books:

- Haykin S., "Communications Systems", John Wiley and Sons, 2001.
- Proakis J. G. and Salehi M.,"Communication Systems Engineering", Pearson Education, 2002.

Reference books:

- Taub H. and Schilling D.L., "Principles of Communication Systems‖, Tata McGraw Hill, 2001.
- Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.
- Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.
- Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

Online links for study & reference materials:

https://nptel.ac.in/courses/117/102/117102059/

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code:EC09 **Course Name:** Analog Electronics
Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

- To Understand the characteristics of diodes and transistors
- Design and analyze various rectifier and amplifier circuits
- Design sinusoidal and non-sinusoidal oscillators
- Understand the functioning of OP-AMP and design OP-AMP based circuits
- Design ADC and DAC

Course Description:

This **course** develops a basic understanding of the fundamentals and principles of **analog circuits** and **electronic** devices in electrical and **electronic** engineering. This understanding is a critical step towards being able to design new **electronic circuits** or use them appropriately as part of a larger engineering system.

Course Contents:

Unit 1

Amplifier models: Voltage amplifier, current amplifier, trans- conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

Unit 2

High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

Unit 3

Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation.

Unit 4

OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog-to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc. Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.

Unit 5

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators(phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.Active filters: Low pass, high pass, band pass and band stop, design guidelines.

Course Learning Outcomes(CLOs) :

At the end of this course students will demonstrate the ability to

- Know about the multistage amplifier using BJT and FET in various configuration to determine frequency response and concept of voltage gain.
- Know about different power amplifier circuits, their design and use in electronics and communication circuits.
- Know the concept of feedback amplifier and their characteristics.
- Design the different oscillator circuits for various frequencies

Text books:

- J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
- A.S. Sedra and K.C. Smith, Microelectronic Circuits, Edition IV**.**

Reference books:

- J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992.
- P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
- Paul R. Gray and Robert G.Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition

Online links for study & reference materials:

https://nptel.ac.in/courses/108/102/108102112/

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: EC11 **Course Name: Microcontrollers**
Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

The objectives of the course are to make the students,

- Know the internal organization, addressing modes and instruction sets of 8085 & 8086 processor.
- Know the various functional units of 8051 microcontroller.
- Understand assembly language program by using 8051 Instruction sets and addressing modes.
- Know the various peripheral devices such as 8255, 8279, 8251, 8253, 8259, stepper motor etc.
- Know the various advance microcontroller like ARM processor etc.
- Understand microcontroller based system design for various applications.

Course Description:

The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/controller implementation. Topics include Semiconductor memory devices and systems, microcomputer architecture, assembly language programming, I/O programming, I/O interface design, I/O peripheral devices, data communications, and data acquisition systems. Several laboratory exercises will be based on both microprocessor (Intel 8086), microcontroller (Intel 8051) and ARM (nuvoTon- Nu-LB-LUC140).

Course Content:

Unit 1

Overview of microcomputer systems and their building blocks, 8085 and 8086 microprocessor, instruction sets of microprocessors.

Unit 2

Memory interfacing, concepts of interrupts and Direct Memory Access, Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters.

Unit 3

Arithmetic Coprocessors; System level interfacing design, Concepts of virtual memory, Cache memory,

Unit 4

Advanced coprocessor Architectures- 286, 486, Pentium

Unit 5

Microcontrollers: 8051 systems, Introduction to RISC processors; ARM microcontrollers interface designs.

Course Learning Outcomes:

At the end of this course students will demonstrate the ability to

- CO1:- Describe the functionalities of 8085 architectures and Assembly language programming Describe the functionalities of 8086 architectures and Assembly language programming
- CO2:- Describe the architecture and functional block of 8051 microcontroller.

- CO3:- Program the functional units of 8051 microcontroller for the given specifications using C/Assembly language.
- CO4:- Describe various peripheral devices such as 8255, 8279, 8251, 8253, 8259 and 8237.
- CO5:-Explain various applications using 8051 microcontroller and basic architectures of PIC, ARM and ATMEGA microprocessors and microcontrollers.

Text Books:

- Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 6th Edition, Penram International Publishing.
- Muhammad Ali Mazidi , Janice Gillispie Mazidi and Rolin D McKinlay, The 8051 microcontroller and embedded systems using assembly and C, second edition Pearson education Asia.
- Mohamed Rafiquzzaman, Microprocessor and Microcomputer based system design, second edition, CRC press

Reference Books:

- Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, third Edition, Penram International Publishers.
- A.K Ray & K.M. Burchandi, Advanced Microprocessor and peripherals Architectures, Programming and interfacing –, second edition, Tata McGraw-Hill .
- Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.

Online links for study & reference materials :

https://www.youtube.com/watch?v=liRPtvj7bFU&list=PL0E131A78ABFBFDD0

https://www.youtube.com/watch?v=95uGOJ1Ud2c&list=PLJGA4olwzpArvcdWULcRuMn2495g0n8j

Assessment method : (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: BSC202 **Course Name:** Biology (Biology for Engineers)
Course Credit: 3 **Total Contact Hour:** 33hr

Course Objective:

- To increase the understanding of living systems.
- To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.
- To understand the Hierarchy of life forms at phenomenological level.
- To convey that ―Genetics is to biology what Newton‘s laws are to Physical Sciences‖ Mendel‘s laws, Concept of segregation and independent assortment.
- To learn the systems in relationship to the self and other organisms in the natural environment.
- To analyze biological processes at the reductionistic level Proteins- structure and function.
- To know and learn the fundamental principles of energy transactions.

Course Description:

This course explains the fundamental biological processes of metabolism, homeostasis, reproduction, development, and genetics, and the relationships between form and function of biological structures at the molecular, cellular, organismal and population levels of the biological hierarchy.

Course Content:

Unit 1. *(2 hours)- Introduction*

Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Unit 2. *(3 hours)- Classification*

Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization - Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata aquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. *E. coli*, *S. cerevisiae*, D. Melanogaster, C. elegance, A. Thaliana, M. musculus.

Unit 3. *(4 hours)-Genetics*

Purpose: To convey that ‒Genetics is to biology what Newton‘s laws are to Physical Sciences‖ Mendel‘s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Unit 4. *(4 hours)-Biomolecules*
Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Unit 5. *(4 Hours). Enzymes*
Purpose: To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Unit 6. *(4 hours)- Information Transfer*
Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Unit 7. *(5 hours). Macromolecular analysis*
Purpose: How to analyses biological processes at the reductionistic level Proteins-structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Unit 8. *(4 hours)- Metabolism*
Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge.

Unit 9. *(3 hours)- Microbiology*
Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Course Learning Outcomes (CLOs):

At the end of this course students will learn:

- The major types of molecules that make up living organisms and how these molecules enable life functions.
- The structures found in cells and the functions of those sub-cellular structures.
- The processes by which cells replicate to produce genetically identical, or genetically variable, daughter cells.
- The roles carbohydrates play in biological systems
- The structure and function of proteins
- Nucleic acids and the role they play in DNA and RNA
- Thermodynamics as applied to biological systems
- Identification and classification of microorganisms.

Text Books:

- N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, ―Biology: A global approach‖, Pearson Education Ltd, 2014.
- E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, ―Outlines of Biochemistry‖, John Wiley and Sons, 2009.

Reference Books:

- D. L. Nelson and M. M. Cox, ―Principles of Biochemistry‖, W.H. Freeman and Company, 2012.
- G. S. Stent and R. Calendar, ―Molecular Genetics‖, Freeman and company, 1978.
- L. M. Prescott, J. P. Harley and C. A. Klein, ―Microbiology‖, McGraw Hill Higher Education, 2005.

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Mid-exam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: HSMC 202 **Course Name:** Human Values
Course Credit Hour: 3Hr T**otal Contact Hour:** 30hr

Course Objective:

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Description:

- This course introduces the fundamental of human values. It includes important insights about self-exploration, right conduct, ethics and harmony.

Course Contents:

Unit 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I.
2. Self-Exploration–what is it? - Its content and process; _Natural Acceptance‘ and Experiential Validation- as the process for self-exploration.
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4.Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority.
5.Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself!

1.Understanding human being as a co-existence of the sentient _I‘ and the material _Body‘.
2.Understanding the needs of Self (_I‘) and _Body‘ - happiness and physical facility.
3.Understanding the Body as an instrument of _I‘ (I being the doer, seer and enjoyer).
4.Understanding the characteristics and activities of _I‘ and harmony in _I‘.
5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
6. Programs to ensure Sanyam and Health.

Unit 3: Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

2. Understanding the meaning of Trust; Difference between intention and competence

3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

4.Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals 5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students‘ lives.

Unit 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. 3.Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. 4.Holistic perception of harmony at all levels of existence.

Unit 5 : Implications of the above Holistic Understanding of Harmony on Professional Ethics

1.Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. 5. Case studies of typical holistic technologies, management models and production systems

Course Learning Outcomes (CLOs):

- CLO-1: Develop the basic concept of human values
- CLO-2: To understand the importance of self-exploration process
- CLO-3: To understand harmony at individual levels
- CLO-4: To understand harmony at nature level
- CLO-5: Develop professional ethics

Textbooks:

- Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 Reference Books 1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Reference books:

- Human Values and Professional Ethics: Values and Ethics of Profession, Jay Shree Suresh and B.S Bahgvan, S.Chand

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1 - 05%

Assignment -2	- 05%
Assessment-3(Mid-Exam)	- 20%
Assignment-3/Quiz-1	- 05%
Assignment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: MC-02 **Course Name:** Python
Course Credit Hour: 3hr **Total Contact Hour:** 34hr

Course Objective:

- Master the fundamentals of writing Python programs
- Learn basic Python coding elements such as variables, identifiers and flow control structures.
- Discover how to work with lists and sequence data.
- Write Python functions to facilitate code reuse.
- Work with the Python standard library
- Explore Python's object-oriented features

Course Description:

This is an introductory course designed for any student interested in using computation to enhance their problem solving abilities. No prior experience in programming is necessary. Students will use their problem solving abilities to implement programs in Python. This course will develop a basic understanding the Python programming language

Course Contents:

Unit 1

Introduction to Python: - History of python programming language, thrust areas of python, overview of programming in Python, identifiers, variables, Expressions and statements, Operators and Operands, data types, indentation, comments, reading input.

Unit 2

Control flow Statements:-if statement, if-else statement, if-else-elif control flow statement, nested if statement, the while loops, the for loop, Strings: Creating and storing strings, basic string operations, formatting strings and string operations.

Unit 3

Functions: Built in functions, function definition and calling the function, default parameters, Lists: Creating list, basic list operations, build in functions used in list, list methods, Dictionaries: Creating dictionaries, built on functions used in dictionaries, dictionary methods.

Unit 4

Tuples: Creates tuples, basic tuple operations, tuple methods, Sets: set methods, Basics Object –oriented Programming: classes and objects, creating classes and objects in python, classes with multiple objects, class attributes vs. data attributes .

Course Learning Outcomes (CLOs):

At the end of the course students will demonstrate the ability to

- Understand python identifiers, variables, Expressions, statements, Operators, operand and data types.
- Implement Conditionals and Loops for Python Programs.
- Use functions and represent Compound data using Lists, Tuples, Dictionaries and strings.
- Implement basics object –oriented components.

Text books:

- Bill Lubanovic, Introducing Python- Modern Computing in Simple Packages, O_Reilly Publication.
- Wesley J. Chun, Core Python Programming, 2nd Edition, Pearson Education.

Reference books:

- Guido Van Russom, Fred L. Drake, An Introduction to Python, Network Theory Limited.
- Magnus Lie Hetland, Beginning Python: From Novice To Professional, Pearson Education.

Online links for study & reference materials:

https://nptel.ac.in/courses/106/106/106106212/

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	-05%
Assignment -2	- 05%
Assessment -3(Mid Term-exam)	-20%
Assignment -3	- 05%
Assessment-4/ Quiz	- 05%
Total Internal Assessment	**- 40%**

Analog and Digital Communication Lab

Teaching Scheme:- 0L:0T:2P **Paper Code: EC08**
Credits:1
List of Experiments:
1. To study the sampling and reconstruction of a given signal.
2. To study amplitude modulation and demodulation.
3. To study frequency modulation and demodulation.
4. To study time division multiplexing.
5. To study pulse amplitude modulation and demodulation.
8. To study pulse code modulation & differential pulse code modulation as well as relevant demodulations.
9. To study quadrature phase shift keying & quadrature amplitude modulation.
10. Study of pulse code modulation and demodulation.
11. Study of delta modulation and demodulation and observe effect of slope overload.
12. Study pulse data coding and decoding techniques for various formats.
13. Study of ASK/FSK/PSK modulator and demodulator.
14. Error Correction and detection using Hamming code.

Analog Electronics Lab

Teaching Scheme:- 0L:0T:2P **Paper Code: EC10**
Credits:1

1. To find the voltage gain of a CE amplifier and to find its frequency response.
2. Design a single stage RC coupled amplifier(BJT and FET).
3. Design a emitter follower circuit using darlington pair.
4. Design a two stage RC coupled amplifier and plot of frequency v/s gain, estimation of Q factor and bandwidth.
5. To design a Class A and Class B amplifier.
6. Design of inverting, non inverting and differential amplifier.
7. Measurement of common mode gain, Differential mode gain, CMRR, Slew Rate.
8. Application of Op-Amp as summing amplifier, Difference Amplifier, Integrator, Differentiator.
9. Oscillator Sinusoidal oscillator (i) Wein bridge (ii) Phase shift (iii) Colpitt's (iv) Hartley.
10. To design and obtain the frequency response of (i) First order low pass Filter,(ii) First order High Pass Filter, Band Pass Filter.
11. To construct a 3-bit R-2-R ladder type D/A converter using op-amp IC 741.

Microcontroller Lab

Teaching Scheme:- 0L:0T:2P **Paper Code: EC12**
Credits: 1

List of Experiments for microcontroller:

1. Write a program to add starting five natural number, odd number and even number using microcontroller.
2. Write a program to multiply and divide two number using microcontrollers.
3. Write a program to find largest and smallest number using microcontroller.
4. Write a program to interface Stepper motor using 8051 Microcontroller.
5. Write a program to interface a DC Motor using 8051 microcontroller.

List of experiment of 8085/8086 micrporocessor.

1. Using 8085/86 Write two different programs for 16 bit addition, one using instruction DAD and another without using instruction DAD.
2. Using 8085/86 Write assembly language program for 8 bit multiplication and division.
3. Using 8085/86 write an ALP to sum two largest number & smallest number.
4. Using 8085/86 write an ALP to count negative numbers from a given list of 10 numbers.
5. Using 8085/86 write an ALP to add odd & even number & Square of a given no.
6. To obtain interfacing of keyboard controller.
7. To obtain interfacing of DMA controller.
8. To perform microprocessor based traffic light control.