Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

Bachelor of Technology

in

Electronics and Computer Science

First Year Scheme & Syllabus

(As per AICTE and NEP 2020 guidelines, with effect from the Academic Year 2023-24)

Preamble

The National Education Policy (NEP) framework aims to break the mold from teacher centric to student centric educational practices. It empowers the students with flexibility in terms of choosing courses across different faculties and modes of learning.

This multidisciplinary approach will encourage learners to follow their passion and inherent interests. The learner is free to learn at a pace that he is comfortable with, and this enables lifelong learning. It also enhances the scope for holistic personality development.
This premise is truly reflected in preamble of the NEP document, "The future of nation is decided in the classrooms of the schools and colleges today".

Details of implementation:
NEP curriculum framework enables us to accelerate change, redesign systems with equity in mind, respond to feedback, encourage collaboration, catch and pollinate ideas and create a culture of research and development. It will allow us to offer the required academic flexibility which will focus on improving competency level of students with diverse strengths.

The curriculum planned by VIT has vertical **Program Courses** consisting of core courses (PCC) of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. This vertical also includes Professional elective courses (PEC) which offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique professional elective courses based on industrial requirements and organizing them into tracks is a special feature of this curricula ensuring employability. The vertical **Multidisciplinary Courses** consists of Open Elective (OE) courses and multidisciplinary minor (MD M) courses. Special vocational and skill development courses are included as a part of **Skill courses** vertical that make student capable to work in industrial environment.

The student is expected to demonstrate their ability through courses in **Experiential Learning Courses** vertical like internships/On Job Training, Community Engagement Project, Real Industry Project/ research problem. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking. This will lead to the creation of products and/ or patents through this program.

For holistic development of students, apart from technical courses, Ability Enhancement Courses, Entrepreneurship/Economics/Management Courses, Indian Knowledge System and Value Education courses from vertical **Humanities and Social Science and Management** develop the required soft-skills and attitude amongst learners.

In **Liberal Learning** vertical courses like Various Dance Forms, Global citizenship Education, Facets of Astronomy etc. aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses.

In addition to core courses, professional and open electives; our framework offers honor degree in each programme of engineering. It includes specialized courses along with field/ domain study that make students capable of working on industry relevant problems.

Chairman, Board of Studies   Chairman, Academic Council
Department of Electronics and Computer Science   Vidyalankar Institute of Technology
Vidyalankar Institute of Technology

Detailed Syllabus of First Year Semester - I

Course Name: Engineering Mathematics-I

Course Code: BS02

NEP Vertical_Basket: Basic Science

Preamble:

The objective of the course is to develop the basic Mathematical skills of engineering learners that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology. Learners impart knowledge of De-Moivre's Theorem, Hyperbolic Functions, and Logarithm of Complex Numbers. The course clarifies the concept of Partial Differentiation and its applications. The course will enable learners to learn basics of Successive Differentiation, Matrices, system of linear equations, Expansions of function and Transcendental Equations.

Pre-requisites:

Nil

Course Objectives:

- To recall and remember basics of Complex, Successive differentiation, and transcendental equations.
- To apply methods to solve engineering problems.
- To solve and evaluate the problems using Complex, Successive differentiation and transcendental equations.
- To analyze problems based on System of Linear Equations

Course Outcomes:

Learner will be able to:

CO1: Illustrate the basic concepts of Complex Numbers and solve problems involving different forms and properties of Complex Numbers.

CO2: Apply the knowledge of complex numbers to solve problems in Hyperbolic Functions and Logarithmicfunction.

CO3: Illustrate the basic principles of Partial Differentiation, Homogeneous functions, and Compositefunctions.

CO4: Illustrate basic principles of Maxima and Minima and Successive Differentiation.

CO5: Apply principles of basic operations of Matrices, Rank, and echelon form of matrices to solvesimultaneous equations.

CO6: Illustrate the concept of Transcendental Equations, linear algebraic equations, and

Expansions offunctions.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Tutorial
3	-	3	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Complex Numbers	Statement of D'Moivre's Theorem. Expansion of $\sin^n \theta$, $\cos^n \theta$ in terms of sines and cosines of multiples of θ and Expansion of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$, Powers and Roots of complex numbers.	7
2	Hyperbolic Function and Logarithm of Complex Numbers	Circular functions of complex number and Hyperbolic functions. Inverse Circular and Inverse Hyperbolic functions. Separation of real and imaginary parts of all types of Functions. Logarithmic functions, Separation of real and Imaginary parts of Logarithmic Functions.	7
3	Partial Differentiation and Applications	Partial Differentiation: Function of several variables, Partial derivatives of first and higher order. Differentiation of composite function. Euler's Theorem on Homogeneous functions with two independent variables (with proof). Deductions from Euler's Theorem. Maxima and Minima of a function of two independent variables, Jacobians of two and three variables	8
4	Successive Differentiation & Expansion of Functions	Successive differentiation: nth derivative of standard functions. Leibnitz's Theorem (without proof) and problems. Taylor's Theorem (Statement only) and Taylor's series, Maclaurin's series (Statement only).Expansion of $\sin(x)$, $\cos(x)$, $\tan(x)$, $\sinh(x)$, $\cosh(x)$, $\tanh(x)$, $\log(1+x)$	8

5	Matrices	Rank of a Matrix using Echelon forms, reduction to normal form and PAQ form. System of homogeneous and non–homogeneous equations, their consistency and solutions.	8
6	Numerical Solutions of Transcendental Equations and linear algebraic equations	Solution of Transcendental Equations: Solution by Newton Raphson method and Regula – Falsi method. Solution of system of linear algebraic equations, by Gauss Jacobi Iteration Method, Gauss Seidal Iteration Method.	7
Total			**45**

Textbook:

1. Ramana B.V.," Higher Engineering Mathematics",12th edition, Tata MCGraw Hill,2017

Reference Books:

1. Dr. B.S. Greswal," Higher Engineering Mathematics",9th Edition, Khanna Publication,2012
2. Erwin Kreysziq," Advanced Engineering Mathematics",9th Edition, Wiley Eastern limited ,2012
3. Srimanta Pal and Subidh C. Bhunia," Advanced Engineering Mathematics", UK Edition, Oxford Press,2015
4. H.K. Das," Advanced Engineering Mathematics",17th Edition, S.Chand, 2008
5. Howard Anton and Christ Rorres "Elementary Linear Algebra with Applications",5th Edition, John Wiley 2012

Course Name: Engineering Physics

Course Code: BS15T

NEP Vertical_Basket: Basic Science

Preamble:

Most of the engineering branches are being offspring of basic sciences where physics is playing a pivotal role in concept and understanding the foundation of core engineering branches. Physics prepares learners to apply physics to tackle 21st century engineering challenges, and to apply engineering to address 21st century questions in physics.

The course will develop the learner awareness in semiconductor devices and quantum Physics The learner will develop an informed appreciation of the paradigm shift already in evidence in technologies behind modern services and products. He will possess basic physics knowledge to pursue simulation and modelling of the semiconductor systems.

Pre-requisites:

Nil

Course Objectives:

- Identify and understand the fundamental physical principals underlying engineering devices and processes - a prerequisite to become successful engineers.
- To provide inclusive knowledge of fundamental physical principles encouraging engineering students to venture into the research field.
- To develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.
- To give exposure to the topics of fundamental physics in semiconductor and Laser.

Course Outcomes:

Learners will be able to:

CO1: Identify various crystallographic planes and understand crystal defects.
CO2: Understand the band theory of solids and the carrier concentration in solids.
CO3: Analyze the charge distribution and charge transport processes in semiconductors.
CO4: Apply the knowledge of Fermi level in semiconductors and applications of semiconductors in electronic devices
CO5: Compare the properties of engineering materials for their current and futuristic frontier Applications.
CO6: Illustrate the working principle of various lasers and quantum processes.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Contents	No. of Hours
01	Crystallography	Bravais Lattice, Lattice Characteristics Miller - Indices, Planes and Directions, Interplanar spacing. Real crystals and crystal defects.	5
02	Semiconductor Physics	Band theory of solids, Classification of semiconductors. Fermi-Dirac statistics, carrier concentration in semiconductors. Concept of Fermi energy level, its position and variation with temperature and impurity concentration.	5
03	Semiconductor Conductivity	Intrinsic carrier density, mobility, and conductivity. Carrier diffusion, drift, and resistance. Electrical conduction in extrinsic semiconductor. Diffusion length and mean lifetime. Hall Effect.	5
04	Semiconductor Devices	Physics of p-n junctions. Fermi level - in equilibrium, in forward and in reverse bias. Band bending in forward and reverse bias junction Introduction to two terminal devices – Rectifier diode, LED, Zener diode, PIN diode, Solar Cell, Schottky diode etc.	5
05	Engineering Materials and Applications	Liquid crystals: Nematic, Smectic and cholesteric phases, Liquid crystal display. Multiferroics: Type I & Type II multiferroics and applications.	4

		Magnetoresistive Oxides: Magnetoresistance, GMR and CMR materials. Introduction to spintronics.	
06	Lasers	Radiation Matter Interactions, Einstein's coefficients. Basics of Laser- Population inversion, Pumping, Optical Resonator, Metastable state etc. Laser Beam Characteristics. Laser Systems - Ruby laser, He-Ne Laser, Semiconductor Laser, Nd-YAG Laser. Engineering applications of Laser.	4
07	Introduction to Quantum Physics	De Broglie hypothesis of matter waves; properties of matter waves. Physical interpretation of wave function Introduction to Schrodinger's equations	2
Total			**30**

Suggested Online Courses:

1. Physics of silicon solar cells Offered by École Polytechnique.
   https://www.coursera.org/learn/physics-silicon-solar-cells
2. Semiconductor Physics Offered by University of Colorado Boulder
   https://www.coursera.org/learn/semiconductor-physics

Textbooks:

1. John Wiley,S.M. Sze Physics of Semiconductor Devices,
2. Prentice Hall India, B. Streetman, and S. Banerjee, Solid State Electronics,
3. Narosa 2008 R.P. Feynman, "The Feynman Lectures on Physics (Vol. 1-3)",
4. Pearson Education 2013-I.S. Tyagi, "Principles of Quantum Mechanics",
5. D.J. Griffiths," Introduction to Quantum Mechanics"
6. R Shankar, second edition Principles of Quantum Mechanics,

Reference Books/Articles:

1. http://dsc.discovery.com/tv-shows/curiosity/topics/10-ways-quantum-physics-will-change-world.htm
2. http://dsc.discovery.com/tv-shows/curiosity/topics/10-real-world-applications-of-quantum-mechanics.htm
3. Leonard I. Schiff, "Quantum Mechanics", Mc Graw Hill/ Asia, Edition 3

Course Name: Engineering Physics Lab

Course Code: BS15P

NEP Vertical_Basket: Basic Science

Preamble:

This course introduces learners to the basics of Experimental Physics and its usage which will equip them with the requisite skillset for higher studies. Most of the engineering branches are being offspring of basic sciences where physics plays a pivotal role in concept and understanding the foundation of core engineering branches.

Pre-requisites:

Nil

Course Objectives:

• To enable learners to apply and tackle 21st century engineering challenges and questions in physics.
• To develop in learners an awareness in semiconductor devices and quantum Physics.
• To facilitate basic physics knowledge to pursue simulation and modelling of semiconductor systems.

Course Outcome:

The students will be able to:

CO-1   Understand the measurement techniques and usage of instruments in physics.

CO-2   Demonstrate competency and understanding of the basic concepts found in

         experimental Physics.

CO-3   Construct and analyze electronic circuits and computer programs.

CO-4   Estimate the error in measurements and the ability to prepare a valid laboratory record.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Experiments

Half Wave Rectifier
Full Wave Rectifier
Electric Motor
Transformer
Transistor as a switch
Transistor in CB and CE mode
Energy Band of a Semiconductor
Hall Effect
Light Emitting Diode
Solar Cell
Zener Diode
PN-junction diode
Wavelength of LASER using grating
Divergence of LASER beam
Grove depth of CD using LASER

Guidelines to conduct practical sessions:

1. The Laboratory work is to be conducted by a group of three-five students.
2. To encourage project-based learning in the curriculum students may either select one of the mini project topics from the list given or a topic of their choice after a review process by the subject faculty.
3. Each group along with subject faculty shall identify a potential area of mini project selected, on which the study can be conducted. They can perform real or virtual experiments related to the topic selected in the laboratory along with regular experiments.
4. Students should prepare working models, power point presentation, posters etc. on the selected topics.
5. Project assessment will be done at the end of the semester.

Suggested List of Mini Projects/PBL (to name few):

1. Electric motor
2. Astable Multivibrator
3. Mini washing machine
4. Half wave and Full wave rectifier.
5. Build an electric Transformer.
6. Making Hologram
7. Zener diode as a voltage regulator
8. Cell phone charger using solar cell.

Recommended Online Courses:

https://vlab.amrita.edu/?sub=1&brch=282&sim=1512&cnt=1

https://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1

https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1

https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html

https://virtuallabs.merlot.org/vl_physics.html

https://phet.colorado.edu

https://www.myphysicslab.com

Reference Books / Articles

1.   Applied Physics Lab Manual by Anoop Sing Yadav

Course Name: Structured Programming

Course Code: ES04T

NEP Vertical_Basket: Engineering Science

Preamble:

To provide exposure to problem-solving by developing an algorithm, flowchart and implement the logic using C programming language.

Course Objectives:

- The course aims to provide exposure to problem solving through programming.
- It aims to train the students the basic concepts of C programming language.
- The course involves a lab component to give students hands on experience with the concepts.
- It aims to provide exposure to handling data through files.

Course Outcomes:

Learner will be able to:

CO1: Understand the fundamentals of a programming language.

CO2: Apply the control structures for code optimization and, hence improving efficiency.

CO3: Decompose a problem and solve it using modular programming.

CO4: Demonstrate the use of derived and user derived data types for collection and processing of data.

CO5: Understand the concept of pointers and files to solve the problems related to dynamic and persistent data.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Fundamentals of C	Character Set, Identifiers and Keywords, Data Types, Constants and Variables Operators, Math Library Functions, Expressions, Pre-processor Directives	4
2	Input and Output	Unformatted and Formatted I/0 Function scanf( ) Function printf( ) Concept of Field width, Precision and Flags Basic Programs Based on Computation	2
3	Control Structures	Conditional Branching - if, if-else statement, nested if-else, and switch-case statement. Looping – for loop, while and do-while loop, nested loops Unconditional Branching – break and continue statement	6
4	Functions	Introduction of Functions Declaration and definition of a Function Calling a Function and passing arguments to a Function Concept of Global and Local Variables Storage Classes –Auto, Extern, Static, Register Recursion	6
5	Arrays, Strings and Structures	Array-Concepts, Declaration, Definition, Accessing array element, One-dimensional and Multidimensional array. String- Basic of String, Array of String, Functions in string.h Structure- Declaration, Initialization, Nested structure, Operation on structures, Array of Structure.	6
6	Pointers and Files	Pointer: Pointer Variables, Reference and Dereference Operators, void Pointer, Call by Reference, Pointer Arithmetic, Pointer to Pointer, Pointers and Array, Passing Arrays to Function, Array of Pointers and Dynamic Memory Allocation. Files: Types of File, File operation- Opening, Closing, Creating, Reading, Processing File.	6
Total			**30**

Text Books:

1. K. R. Venugopal and Sudeep Prasad, "Mastering C", Tata McGraw Hill.
2. Behrouz Forouzan, "A Computer Science –Structure Programming Approaches using C", Cengage Learning.
3. Byron S. Gottfried, "Schaum's outlines Programming with C", Tata McGraw Hill.

Reference Books:

1. M. G. Venkateshmurthy , "Programming Techniques through C", Pearson Publication.
2. E. Balaguruswamy "Programming in ANSI C", Tata McGraw Hill.
3. Pradeep Day and Manas Gosh, "Programming in C", Oxford University Press
4. Yashwant Kanetkar , "Let Us C", BPB Publication

Course Name: Structured Programming Lab

Course Code: ES04P

NEP Vertical_Basket: Engineering Science

Preamble:

To provide exposure to problem-solving by developing an algorithm, flowchart and implementing the logic using C programming language.

Pre-requisites:

Nil

Course Objectives:

- Impart hands on experience with C programming.
- Introduce various programming platforms like TurboC, CodeBlocks, Visual Studio
- Train the students towards developing solutions for real world problems using procedure-oriented methodology.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate the use of datatypes and operators supported by C.
CO2: Demonstrate the use of decision making and looping constructs.
CO3: Decompose a problem and solve it using functions.
CO4: Develop applications to handle large data using arrays and structure.
CO5: Demonstrate use of pointers and files.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

Sr.no.	Suggested Topic(s)	No. of experiments
1	Computation Based Programs	1
2	Programs using if .. else and nested if .. else	2
3	Programs using switch case	2
4	Programs using for loop	3
5	Programs using while loop	2
6	Programs on Functions	2
7	Programs on Recursion	2
8	Programs using 1D and 2D Arrays	3
9	Programs using Strings	2
10	Programs on Structures	2
11	Programs using Call by Reference	1
12	Programs using Dynamic Memory Allocation	1
13	Programs on Files	2

Suggested List of Assignments:

1. Assignment on tokens
2. Assignment on decision making statements.
3. Assignment on looping statements
4. Assignment on arrays
5. Assignment on functions
6. Assignment on structure
7. Assignment on file and pointers

Suggested List of Value-Added Home Assignments:

Practicing problem solving using c on online coding challenge platforms like HackerRank, TopCoder

Suggested Online Courses:

1. Online course on Coursera : https://www.coursera.org/specializations/c-programming
2. Online course on Edx : https://www.edx.org/course/c-programming-getting-started?index=product&queryID=e2368608f2fb78f99be968cfde1b511f&position=1&v=2&linked_from=autocomplete&c=autocomplete

Text Books:

1. K. R. Venugopal and Sudeep Prasad, "Mastering C", Tata McGraw Hill.
2. Byron S. Gottfried, "Schaum's outlines Programming with C", Tata McGraw Hill.

Reference Books:

1. M. G. Venkateshmurthy, "Programming Techniques through C", Pearson Publication.
2. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw Hill Education.
3. Yashwant Kanetkar, "Let Us C", BPB Publication

Course Name: Digital Electronics

Course Code: ES03T

NEP Vertical_Basket: Engineering Science

Preamble:

Digital electronics is important to understand the design and working of a wide range of applications in variety of fields. In most of the applications the size is decreasing by employing complex technology. It is essential for engineers to understand fundamental, Implementation and application. Thus, enabling them to use the most appropriate and effective technique to suit their technical needs.

Pre-requisites:

Nil

Course Objectives:

- To understand various number systems, codes and to introduce the students to various logic gates, SOP, POS form and their minimization techniques.
- To teach the working of combinational circuits, their applications and implementation of
- combinational logic circuits using MSI chips.
- To teach the elements of sequential logic design, analysis, and design of sequential circuits.
- To understand various counters and shift registers and its design using MSI chips.
- To explain and describe various logic families and Programmable Logic Devices.
- To write program with Verilog hardware description languages.

Course Outcomes:

Learners will be able to:

CO1: Understand various number systems and able to apply Boolean algebra for the
implementation and minimization of logic functions.
CO2: Analyze, design, and implement Combinational logic circuits using MSI chips.
CO3: Analyze, design, and implement Sequential logic circuits MSI chips.
CO4: Design and implement various counters and shift registers depending on application using MSI.
chips.
CO5: Simulate and implement basic combinational and sequential circuits using VHDL.
CO6: Understand TTL, CMOS logic families, PLDs, CPLD and FPGA.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Fundamentals of Digital Design	Number Systems and Codes: Review of Number System, Binary Code, Binary Coded Decimal, Octal Code, Hexadecimal Code and their conversions. Binary Arithmetic: One's and two's complements Codes: Excess-3 Code, Gray Code, Weighted code, Parity Code: Hamming Code Logic Gates and Boolean Algebra: Digital logic gates, Realization using NAND, NOR gates, Boolean Algebra, De Morgan 's Theorem, SOP and POS representation, K Map up to four variables.	6
2	Combinational Circuits	Arithmetic Circuits: Half adder, Full adder, Ripple carry adder, Carry Look ahead adder, Half Subtractor, Full Subtractor, multiplexer, cascading of Multiplexer, demultiplexer, decoder, Comparator MSI devices: IC7483, IC74151, IC74138, IC7485 (To be covered in the laboratory)	6
3	Elements of Sequential Logic Design	Sequential Logic: Latches and Flip-Flops. Counters: Asynchronous Counters, Synchronous Counters, Up Down Counters, Mod Counters, Ring and Twisted Ring Counters, Shift Registers, Universal Shift Register	8
4	Sequential Logic Design	Sequential Logic Design: Mealy and Moore Machines, clocked synchronous state machine analysis State reduction techniques using implication chart method and state assignment, sequence detector.	6

		Sequential logic design practices: MSI counters (7490, 7493,74163, 74169) and applications, MSI Shift registers (74194) and their applications (To be covered in the laboratory)	
5	Introduction to VHDL	Introduction: Overview of different design styles Design and implementation of adder, subtractor, multiplexer and flip flop using VHDL	4
6	Programmable logic Devices	Concepts of PROM, PAL and PLA. Interfacing CMOS to TTL and TTL to CMOS. Architecture of CPLD, FPGA.	4
Total			**30**

Text Books:

1. R. P. Jain, Modern Digital Electronics, Tata McGraw Hill Education, Third Edition 2003.
2. Morris Mano, Digital Design, Pearson Education, Asia 2002.
3. J. Bhaskar, A Verilog HDL Primer, Third Edition, Star Galaxy Publishing, 2018.

Reference Books:

1. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006
2. John F. Warkerly, Digital Design Principles and Practices, Pearson Education, Fourth Edition, 2008.
3. Stephen Brown and Zvonko Vranesic, Fundamentals of digital logic design with Verilog design, McGraw Hill, 3rd Edition.
4. Digital Circuits and Logic Design – Samuel C. Lee, PHI
5. William I.Flectcher, ―An Engineering Approach to Digital Design‖, Prentice Hall of India.
6. Parag K Lala, ―Digital System design using PLD‖, BS Publications, 2003.
7. Charles H. Roth Jr., ―Fundamentals of Logic design‖, Thomson Learning, 2004.

Course Name: Digital Electronics Lab

Course Code: ES03P

NEP Vertical_Basket: Engineering Science

Preamble:

Digital electronics is important to understand the design and working of a wide range of applications in variety of fields. In most of the applications the size is decreasing by employing complex technology. Itis essential for engineers to understand fundamental, Implementation and application. Thus, enabling them to use the most appropriate and effective technique to suit their technical needs.

Course Objectives:

- To understand various number systems, codes and to introduce the students to various logic gates,SOP, POS form and their minimization techniques.
- To teach the working of combinational circuits, their applications and implementation of combinational logic circuits using MSI chips.
- To teach the elements of sequential logic design, analysis, and design of sequential circuits.
- To understand various counters and shift registers and its design using MSI chips.
- To explain and describe various logic families and Programmable Logic Devices.
- To write program with VHDL hardware description languages.

Course Outcomes:

Learners will be able to:

CO1: Understand various number systems and able to apply Boolean algebra for the
     implementation and minimization of logic functions.

CO2: Analyze, design, and implement Combinational logic circuits using MSI chips.

CO3: Analyze, design, and implement Sequential logic circuits MSI chips.

CO4: Design and implement various counters and shift registers depending on application using MSI.
     chips.

CO5: Simulate and implement basic combinational and sequential circuits using VHDL.

CO6: Understand TTL, CMOS logic families, PLDs, CPLD and FPGA.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Guidelines to conduct practical sessions and Mini projects for ISA:

At least 6 experiments covering entire syllabus of EC01T (Electronic Devices and Circuits Lab) should be set to have well predefined inference and conclusion. The experiments should be student centric and attempt should be made to make experiments more meaningful, interesting. Simulation experiments are also encouraged. Experiment must be graded from time to time. . Practical and Oral exam will be based on the entire syllabus.

1. To encourage project-based learning in the curriculum, mini project is mandatory in a group of four students.
2. In addition to the Mini project work each student needs to perform laboratory experiments during lab sessions.
3. Practical assessment should be done on weekly basis and Mini project assessment at least twice in a semester.
4. Preferably certify the practical work during the last practical session.

Suggested List of Hardware Experiments:

Sr. No.	Experiment Title
1	Simplification of Boolean functions.
2	Design AND, OR, NOT, EXOR, EXNOR gates using Universal gates: NAND and NOR.
3	Implement Half adder, Full adder, Half subtractor and Full subtractor circuits.
4	Design and implement adder and subtractor using 4-bit Binary Adder IC-7483.
5	Implement logic equations using Multiplexer IC 74151
6	Design and implement Magnitude Comparator using IC 7485
7	Verify truth table of different types of flip flops using hardware
8	Design asynchronous/synchronous MOD N counter using ICs (7490, 7493,74163, 74169)

Suggested List of Simulation Experiments

Sr. No.	Experiment Title
1	Verify truth table of different types of flip flops using software Logisim.
2	Flip flop conversions JK to D, JK to T and D to TFF using Logisim
3	Design asynchronous/synchronous MOD N counter using ICs (7490, 7493,74163, 74169)
4	Write VHDL simulation code for different logic gates.
5	Write VHDL simulation code for combinational arithmetic circuits.
6	Write VHDL simulation code for Flip-Flops and sequential circuits.

Course Name: Engineering Mechanics

Course Code: ES02T

NEP Vertical_Basket: Engineering Science

Preamble:

To improve the skill sets to understand forces and motions associated with particles and rigid bodies. This course also imparts and inculcates learners to understand force system and its effects.

Pre-requisites:

Nil

Course Objectives:

- To know and apply the concept of force, force system and conditions of equilibrium.
- To find out Centroid of plane areas.
- To study and analyze of different types of the motions of particles and rigid bodies.
- To know the concept of instantaneous centre of rotation (ICR)

Course Outcomes:

Learner will be able to:
CO1: Ability to understand and analyze forces, force systems and equilibrium.
CO2: Understand and verify law of Moments.
CO3: Determine the centroid of plane lamina.
CO4: Evaluate co-efficient of friction between the different surfaces in contact.
CO5: Understand and apply basic concepts of Kinematics of particles and kinematics of rigid bodies.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	System of Coplanar Forces	Introduction to Force and Force systems (Concurrent, Parallel and General coplanar force system), resolution composition and resultant of force systems. Principle of transmissibility of a force, Moment of force about a point, Couples, Varignon's Theorem. Force couple system.	6
2	Centroid	First moment of Area, Centroid of Regular composite plane Laminas	4
3	Equilibrium	Equilibrium of rigid beams: Free body diagrams. Conditions of equilibrium. Types of supports & types of loads. Determination of supports reactions for different types of loads on the beams.	5
4	Friction	Coefficient of static and dynamic friction, Laws of friction, Angle of Friction, Angle of Repose. Concept of Cone of friction. Equilibrium of bodies on horizontal & inclined plane.	4
5	Kinematics of Particle	Uniformly accelerated motion along straight line, motion under gravity, Projectile Motion.	7
6	Kinematics of Rigid Bodies	Introduction to different types of motion a Rigid body performs viz. Translation, Rotation and General Plane motion. Concept of Instantaneous Centre of rotation (ICR) for the finding velocity. Locating ICR for multiple link mechanism. Velocity analysis of rigid body using ICR.	4
Total			**30**

Text Books:

1. A K Tayal, Engineering Mechanics, Umesh Publication, 14th edition.
2. K L Kumar, Engineering Mechanics, Tata McGraw-Hill, 3rd edition.
3. R. S. Khurmi, Engineering Mechanics, S. Chand Publication, 1st edition.

Reference Books:

1. R. C. Hibbeler, Engineering Mechanics, Pearson Publication, 14th edition.
2. Beer & Johnston, Engineering Mechanics, Tata McGraw-Hill Education, 12th edition.
3. F. L. Singer, Engineering Mechanics, Harper& Raw Publication, 2nd edition.
4. W. G. McLean & E. W. Nelson, Engineering Mechanics, Tata McGraw- Hill Education, 3rd edition.
5. J. L. Meriam and L. G. Kraige, Engineering Mechanics (Statics), Wiley Books, 7th edition

Course Name: Engineering Mechanics Lab

Course Code: ES02P

NEP Vertical_Basket: Engineering Science

Preamble:

This course introduces the basic concepts of forces and centroids and techniques of finding their effects on rigid body. It introduces the phenomenon of friction and its effects. It introduces students to cognitive learning in applied mechanics and develops problem-solving skills in both theoretical and engineering oriented problems. After completing this course students can deal with the forces and motions associated with particles and rigid bodies.

Pre-requisites:

1. Physics – Strongly Related
2. Mathematics - Strongly Related
3. Basic computer knowledge – Strongly Related.

Course Objectives:

1. To develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.
2. To acquaint the concept of equilibrium in two-dimensional system.
3. To study and analyse motion of moving particles/bodies.

Course Outcome:

Student will be able to:
CO1: Verify equations of equilibrium of coplanar force system.
CO2: Verify law of Moments.
CO3: Determine the centroid of plane lamina.
CO4: Evaluate co-efficient of friction between the different surfaces in contact.
CO5: Understand and be able to apply basic dynamic concepts of Kinematics of particles and rigid bodies.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Examination Scheme:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

List of Experiments:

Sr. No.	Experiment Hours in Practical Session	Hours
1	Verification of principle of moment /Bell crank Lever - By using simulation software	02
2	Determination of support reactions of simply supported beam - By using simulation software	02
3	Determination of coefficient of friction using inclined plane method - By using simulation software.	02
4	Projectile Motion - By using simulation software	02
5	Verification of Law of Polygon of Coplanar Concurrent Forces - By using simulation software	02
6	Determine the Centroid of plane lamina - By using simulation software	02
7	Determination of coefficient of kinetic friction using D-Alembert Principle - By using simulation software	02
8	Determination of Stiffness of Spring	02
9	Verification of Law of Polygon of Coplanar Non-Concurrent & Non-Parallel Forces - By using simulation software	02
10	Motion Curves - By using simulation software	02

List of Assignments:

Sr. No.	Assignment Hours in Practical Session	Hours
1	Resultant of coplanar Forces	02
2	Centroid	02
3	Equilibrium	02
4	Friction	02
5	Kinematics of Particle	02
6	Kinematics of Rigid Bodies	02

In Semester Assessment:
The distribution of marks for term work shall be as follows:
   ➢ Practical Work and Journal: 10 marks.
   ➢ Assignments: 10 marks.
   ➢ Attendance: 05 Marks

End Semester Examination:
Pair of Internal and External Examiner should conduct Oral examination based on entire syllabus.

References:

1. Engineering Mechanics by R. C.Hibbeler.

2. Engineering Mechanics by Beer &Johnston, Tata McGrawHill

3. Engineering Mechanics by F. L. Singer, Harper& RawPublication

4. Engineering Mechanics by Macklin & Nelson, Tata McGrawHill

5. Engineering Mechanics by ShaumSeries

6. Engineering Mechanics (Statics) by Meriam and Kraige, WileyBools

7. Engineering Mechanics (Dynamics) by Meriam and Kraige, WileyBools

Detailed Syllabus of First Year Semester - II

Course Name: Engineering Mathematics-II

Course Code: BS04

NEP Vertical_Basket: Basic Science

Preamble:

The objective of the course is to develop the basic Mathematical skills of engineering learners that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology, impart fundamental knowledge of Differential Equations of First Order, Higher Order, Special functions like Beta and Gamma Function, Double and Triple Integration, DUIS, Rectification, Numerical solutions of Differential Equations and Numerical Integration.

Pre-requisites:

BS02

Course Objectives:

- To recall and remember basics of differential equations, integral Calculus.
- To apply methods to solve engineering problems.
- To solve and evaluate the problems using Multiple Integration, Numerical Integration.
- To analyze problems based on Numerical Methods for solving differential Equations.

Course Outcomes

Learner will be able to:

CO1: Illustrate the concept of Exact Differential equation and solution of various types of First Order First Degree Differential Equations.

CO2: Illustrate the concept of Complementary Function and Particular Integral and solution of LinearDifferential Equations with constant coefficients.

CO3: Illustrate the concepts of Beta, Gamma function and DUIS.

CO4: Illustrate the concept of Double Integral in Cartesian and Polar form, change the order of Integration,Evaluate Double Integral over a given region.

CO5: Illustrate the concept of changing to polar coordinates in double integrals. Application of doubleintegrals to compute Area, Evaluation of Triple Integration.

CO6: Illustrate the concept of Numerical solution of Ordinary Differential Equation, and Numerical integration using various methods.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Tutorial
3	-	3	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Differential Equations of First Order and First Degree	Exact differential Equations, Equations reducible to exact form by using integrating factors. Linear differential equations (Review), equation reducible to linear form, Bernoulli's equation	7
2	Linear Differential Equations with Constant Coefficients and Variable Coefficients of Higher Order	Linear Differential Equation with constant coefficient- complementary function, particular integrals of differential equation of the type f(D)y = X where X is eax, $\sin(ax + b)$, $\cos(ax + b)$, x^m, m is positive integer, $e^{ax}V$, $x.V$ or X. Method of variation of parameters	8
3	Beta and Gamma Function and Differentiation under Integral sign	Beta and Gamma functions and its properties. Differentiation under integral sign with constant limits of integration.	7
4	Multiple Integration-1	Double integration-definition, Evaluation of Double Integrals. (Cartesian & Polar), Evaluation of double integrals by changing the order of integration. Evaluation of integrals over the given region. (Cartesian & Polar)	8
5	Multiple Integration-2	Evaluation of double integrals by changing to polar coordinates. Application of double integrals to compute Area, Triple integration definition and evaluation (Cartesian, cylindrical and spherical polar coordinates).	8

6	Numerical solution of ordinary differential equations of first order and first degree, and Numerical Integration	Numerical solution of ordinary differential equation using Euler's method and Runge-Kutta fourth order method Numerical integration-by Trapezoidal, Simpson's 1/3rd and Simpson's 3/8th rule .	7
Total			**45**

Text Books:

1. Ramana B.V.,"Higher Engineering Mathematics",12th Edition, Tata McGraw Hill,2017

Reference Books:

1. Dr. B.S. Greswal ,"Higher Engineering Mathematics",9th Edition, Khanna Publication,2012
2. Erwin Kreysziq ,"Advanced Engineering Mathematics",9th Edition, Wiley Eastern limited ,2012
3. Srimanta Pal and Subidh C. Bhunia ,"Advanced Engineering Mathematics", UK Edition, Oxford Press, 2015
4. H.K. Das," Advanced Engineering Mathematics",17th Edition, S. Chand,2008
5. Howard Anton and Christ Rorres "Elementary Linear Algebra with Applications",5th Edition, John Wiley 2012

Course Name: Engineering Chemistry

Course Code: BS16T

NEP Vertical_Basket: Basic Science

Preamble:

This course imparts learners sound knowledge on the fundamentals of chemistry which can be applied in various courses and projects taken in Electronics and Computer Science, Electronics and Telecommunication and Biomedical Engineering.

Pre-requisites:

Nil

Course Objectives:

- The contents of this course will aid in quantification and understand the applications of several concepts in Chemistry.
- To appreciate the need for and importance of engineering chemistry for industrial and domestic use.
- To gain the knowledge on existing and future upcoming materials used in device fabrication.
- To impart knowledge of green chemical technology and its applications.
- To enhance the thinking capabilities in line with the modern trends in engineering and technology.

Course Outcomes:

Learner will be able to:

CO1: Interpret properties, synthesis, and uses of important materials in various engineering. applications.

CO2: Apply the fundamentals of electrochemistry in prevention & control measures related to corrosion of structures and devices.

CO3: Rationalise different types of batteries and their real-life engineering applications.

CO4: Analyse different spectroscopic techniques and study fundamentals of electromagnetic spectrum.

CO5: Associate Green Chemistry principles in product development knowledge.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Polymer Chemistry	Introduction to Polymer, Properties of Polymers-Molecular weight, numerical problems on molecular weight, Glass transition temperature Methods of polymerization, Synthesis, Properties and Uses of commercially important polymers, Study of Speciality polymers like Conducting polymers, Liquid Crystal Polymer etc., Applications of Polymers	6
2	Electrochemistry and Corrosion	Electrochemistry- Basics, Types of electrochemical cells, Electrochemical series and Galvanic series, Nernst equation, Numerical problems, Construction & Application of various electrodes Corrosion- Chemical and Electrochemical corrosion, Mechanism, Types- Differential aeration, Galvanic, Stress, Intergranular, Microbial, Soil corrosion etc., Prevention and control Measures, Case studies like- Corrosion in human body implants & Corrosion in electronic gadgets	6
3	Energy Storage systems	Fundamentals of Energy storage, primary cells and secondary cells, Types of Batteries, Construction and application of Li-Ion battery Fuel cells- principle, components of fuel cell, types of fuel cell, applications, advantages and disadvantages, hydrogen production and hydrogen storage system Numerical problems	4
4	Chemistry of Semiconductors	Silicon & Germanium - Physical and chemical properties, Isotopes, Chemistry of compounds like GaAs, GaP, InP. InGaAs, ZrO, HfO and applications in industry	3
5	Engineering Materials	Nanomaterials: Introduction, Graphene, Fullerenes, Carbon nanotubes, Electronic and Mechanical properties, Synthesis of CNT, Role of nano materials in electronics, Photonics, MEMS, Energy Nano-bio application Composite Materials: Types, properties, and industrial applications	5

Module No.	Module Name	Content	No. of Hours
		Shape Memory alloys: Principle, properties, super elasticity-One way and two-way shape memory effect, Austenite and martensite transformations, applications Smart Materials: Self-Assembled Nanostructures - Energy Harvesting Materials, Intelligent Materials – Magneto strictive Materials	
6	Spectroscopic techniques	Fundamentals of Spectroscopy, Electromagnetic spectrum, Different Forms of Spectroscopy, Beer-Lambert's law- Numerical problems, Techniques, Instrumentation and applications in Medicines and electronics	4
7	Green Chemistry	12 Principles of Green Chemistry & application in green computing & Green Electronics, Numerical problems	2
Total			**30**

Text Books:

1. Shashi Chawla, "A Textbook of Engineering Chemistry", Dhanpat Rai & Co. (PVT.) LTD., New Delhi (2004).
2. S. S. Dara, "Engineering Chemistry", Chand & Co, New Delhi (2006)
3. Jain and Jain, "Engineering Chemistry", Dhanpat Rai & Co (PVT.) LTD, New Delhi (2006).

Reference Books:

1. B.R. Puri and L.R. Sharma, "Principles of Physical Chemistry", 45th Edition, Vishal Publishing Co. 2012.
2. Peter Atkins, "Physical Chemistry", XI th ed, Oxford, United Kingdom, Oxford University Press, 2017
3. V. K. Ahluwalia, "Green Chemistry: A textbook", Alpha Science International
4. J. D. Lee, "Concise Inorganic Chemistry"
5. V.R.Gowariker, "Polymer Science", New Age International Publication
6. S.K.Kulkarni, "Introduction to Nanotechnology"
7. C. N. Banwell, Elaine M. McCash, "Fundamentals of Molecular Spectroscopy", (4th edition), Tata McGraw Hill.
8. Y.R. Sharma, "Elementary Organic Spectroscopy", S. Chand and Co.
9. William D. Callister, "Materials Science and Engineering: An Introduction", Wiley
10. Mel Schwartz, "Smart Materials", CRC Press New York, 2009
11. Dimitris C. Lagoudas, "Shape Memory Alloys", Springer, New York, 2008
12. Micky Rakotondrabe, "Smart Materials- Based Actuators at Micro/Nano-Scale", Springer Science + Business Media, New York, 2013

Course Name: Engineering Chemistry Lab

Course Code: BS16P

NEP Vertical_Basket: Basic Science

Preamble:

This course imparts students sound knowledge on the fundamentals of chemistry which can be applied in various courses and projects taken in Electronics and Computer Science, Electronics and Telecommunication and Biomedical Engineering.

Pre-requisites:

Nil

Course Objectives:

- Students will develop and apply the appropriate lab skills.
- The students will be able to apply chemical concepts to solve qualitative and quantitative problems in engineering.
- Students will be able to present information in clear and effective manner. They will be able to work effectively in a diverse group to solve scientific problems.

Course Outcome:

The students will be able to:

CO1: Apply the knowledge of engineering materials into designing solutions to problems statements.
CO2: Analyse the principles of electrochemistry, in various applications like batteries, electroplating, electrolysis, etc.
CO3: Implement spectroscopy principles in qualitative and quantitative analysis of materials.
CO4: Relate the Green Chemistry principles in engineering projects, products.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Experiments

To determine free acid pH of different solutions using pH meter

To determine the Wavelength of Maximum Absorbance using colorimeter.

To determine metal ion concentration using colorimeter.

To determine Molecular weight of polymers by Oswald Viscometer.

To synthesize UF, PF, Nylon 66.

To synthesize biodegradable polymer.

To determine Viscosity of oil by Redwood Viscometer

To separate pigments using paper chromatography.

To determine total, temporary, and permanent hardness of water sample by EDTA method.

To construct the battery and measure potential difference across two terminals

To identify the materials and learn their properties

To set up a galvanic cell

To set up an electrolytic cell and carry out electroplating

To carry out etching of the Printed Circuit Board (PCB)

To synthesize a nanomaterial and study its characterization

To detect the adulteration in given milk sample

Virtual experiment on Nanomaterial using open-source tool- www.nanohub.org

Virtual experiments using open-source tool - https://vlab.amrita.edu

Guidelines to conduct practical sessions:

1. The labs should be evaluated on a continuous mode. So, no final journal submissions are expected by students.
2. Each lab should be drafted in the form of an application, concept, or problem statement.
3. Out of 10 labs mentioned, students are expected to perform at least 8 for grading.
4. Tools and rubric for lab are explicitly mentioned and followed.
5. Final evaluation will be conducted in the form of display and demonstration by student groups.

Suggested List of Mini Projects/PBL (to name few):

Corn Ethanol: Using Corn to Make Fuel?

Hydrogen Powered Cars: The Wave of the Future?

Organic Chemistry and Your Cellphone: Organic Light-Emitting Diodes

Biomaterials: materials that mimic nature

Composite materials: steel-reinforced concrete, space shuttle thermal insulation tiles and lightweight carbon-fibre composites

Batteries and fuel cells for electric vehicles

Shape memory alloys

Recommended Online Courses:

1. Nanotechnology: A Maker's course offered by Duke University, North Carolina State University The University of North Carolina at Chapel Hill
https://www.coursera.org/learn/nanotechnology

2. Fundamentals of Material Science offered by Shanghai Jiao Tong University
https://www.coursera.org/learn/fundamentals-of-materials-science

3. Smart materials: Microscale and macroscale approaches offered by Peter the Great St. Petersburg Polytechnic University and Kazan National Research Technological University

https://www.coursera.org/learn/smart-materials-microscale-and-macroscale-approaches

Course Name: Engineering Graphics

Course Code: ES01T

NEP Vertical_Basket: Engineering Science

Preamble:

To improve the visualization skills of the learners, with imparting the learner's ability to read a drawing. This course also imparts and inculcate learners to understand the theory of projection.

Pre-requisites:

Nil

Course Objectives:

- To understand the concepts of the Engineering Graphics.
- To know how to use drawing instruments for drafting and dimensioning.
- To understand visualization technic and skills of Engineering Graphics.
- To know the Construction of 3D object.
- To introduce the tools of Computer Aided drafting (CAD).

Course Outcomes:

Learner will be able to:
CO1: Understand conventional method and usage of CAD software.
CO2: Apply the basic principles of projections and visualization to communicate ideas graphically.
CO3: Construct the drawing of curves, points, straight lines, and planes using concept of projections.
CO4: Interpret the three-dimensional pictorial objects and represent in two-dimensional views.
CO5: Construct three dimensional shapes from two dimensional views using the concept of projections.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment

methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Introduction to Engineering Graphics and CAD	Introduction and importance of engineering graphics. Introduction of different types of the quadrants, method of projection, lines and dimensioning. Drawing instruments and their usage. Introduction Computer Aided Design and Drafting (CADD or CAD) software and operations, menu system and toolbars.	3
2	Engineering Curve	Basic construction of cycloid, involutes, and helix of cylinder.	4
3	Projection of points, lines	Projections of lines, inclined to both the reference planes HP and VP as per the first angle projection method.	4
4	Projection of Planes	Projection of rectangular, triangular, square, pentagonal, hexagonal, and circular planes, inclined to both the reference planes HP and VP as per the first angle projection method.	4
5	Orthographic Projections	Drawing orthographic views from pictorial projections. Sectional orthographic Projections of a simple machine part as per the first angle projection method. - By drafting in the sketchbook as well as on CAD software. CAD Drawing: Applying dimensions to objects, applying annotations to drawings, setting up and use of layers, changing of the line properties, Printing setup and procedure. Different CAD Tools and usage- Draw tools, modify tools, properties, copy selection, dimensioning and editing (text height and arrow size).	9
6	Isometric Views	Drawing Isometric views from given views of simple blocks with plane, cylindrical surfaces, and circular holes. - By drafting in the sketchbook as well as on CAD software CAD Drawing: Switching to isometric drafting mode, switch /change to different ISO planes, ISO circles on different ISO planes,	6

		Different CAD Tools and usage- Draw tools, Modify tools, Properties of line.	
Total			**30**

Text Books:

1. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", 53rd Edition, Charotar Publishing House Pvt. Ltd., 2014
2. N.D. Bhatt & V.M. Panchal, "Machine Drawing",50th edition, Charotar Publishing House Pvt. Ltd. 2014
3. Dhananjay A Jolhe, "Engineering Drawing" 1st edition, Tata McGraw Hill, 2017

Reference Books:

1. Prof. Sham Tickoo (Purdue University) & Gaurav Verma, "(CAD Soft Technologies): Auto CAD 2012 (For engineers and Designers)", Dreamtech Press New Delhi, 2012
2. "Learning AutoCAD", Autodesk Official Training Guide, 2009

Course Name: Engineering Graphics Lab

Course Code: ES01P

NEP Vertical_Basket: Engineering Science

Preamble:

This course improves the visualization skills of the students, with imparting the student's ability to read a drawing. This course also imparts and inculcate students to understand the theory of projection.

Pre-requisites:

 Nil

Course Objectives:

- To impart the knowledge of reading a drawing.
- To Use AutoCAD for daily working process.
- To teach basic utility of Computer Aided drafting (CAD) tool.

Course Outcome:

Student will be able to:
CO1: Apply the basic principles of projections in 2D drawings using CAD software.
CO2: Create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features.
CO3: Apply the concepts of layers to create drawing.
CO4: Apply basic AutoCAD skills to draw different views of a 3D object.
CO5: Apply basic AutoCAD skills to draw the isometric view from the given two views.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

Sr. No.	List of Practicals to be performed using AutoCAD
1	Draw: Types of the lines, circle, Polygons, dimensioning, and nameplate.
2	Draw: Bridge Rectifier Circuit
3	Draw: Projection of Planes
4	Draw: Orthographic Projection (without section)
5	Draw: Orthographic Projection (with section)
6	Problem Based Learning (PBL) /mini project on Orthographic Projections
7	Draw: Isometric Views
8	Problem Based Learning (PBL) /mini project on isometric views

Reference Books:

1. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publisher.
2. Prof. Sham Tickoo (Purdue University) &GauravVerma, "(CAD Soft Technologies) : Auto CAD 2012 (For engineers and Designers)", Dreamtech Press NewDelhi.
3. Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill.
4. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd.
5. N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd.
6. Kendrol Phillips, "AutoCAD beginner's guide"

Course Name: Object Oriented Programming

Course Code: ES05T

NEP Vertical_Basket: Engineering Science

Preamble:

The course aims to advance student's knowledge in problem solving and programming principles for real world applications through object-oriented programming using Java language. The course emphasizes data abstraction and object-oriented programming design through the implementation of classes, objects and related concept like Inheritance, Polymorphism, Exception Handling, Multithreading and Applets.

Course Objectives:

- The course aims to provide exposure to problem solving through object-oriented programming.
- It aims to train the students the basic concepts of Java programming language.
- The course involves a lab component to give students hands on experience with the OOP concepts.
- It aims to provide exposure to develop web-based application.

Course Outcomes:

Learner will be able to:
CO1: Apply fundamental Programming Constructs.
CO2: Illustrate the concept of packages, classes, and objects.
CO3: Elaborate the concept of strings, arrays, and vectors.
CO4: Implement the concept of inheritance and interfaces.
CO5: Implement the notion of exception handling and multithreading.
CO6: Develop GUI based applications.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Introduction to Java	Features of Java, Platform Independence – Byte Code, JVM, JRE. Data Types Operators, Control Structures, Static Data, Static Function, 1D Array and 2D Array	4
2	Object Oriented Programming	Classes and Objects, Instance Variables, Constructors Object Passing Methods, Method Overloading, Array of Objects	4
3	Inheritance	Concept and Types Constructors in Inheritance Method Overriding and Dynamic Method Dispatch, abstract and final keyword Interfaces – Concept and Significance Wrapper Classes – String, StringBuffer, Vector	7
4	Exception Handling	Concept of Exception, Types –Checked and Unchecked Use of throws keyword. try-catch-finally keywords. Throwing Exception manually User Defined Exceptions	5
5	Multithreaded Programming	Creating Thread – Different Methods Using Thread Methods, Thread Exceptions, Priorities Life Cycle of Thread Synchronization	5
6	Packages and Applets	Inbuilt Package, Importing Packages User Defined Packages, Naming Packages, Advantages of Packages Applet Basics, Applet Life Cycle Applet Drawing Methods,	5
Total			**30**

Text Books:

1. Herbert Schildt, "JAVA: The Complete Reference", Oracle Press
2. Sachin Malhotra and Saurabh Chaudhary, "Programming in JAVA", Oxford University Press

Reference Books:

1. Beginning JAVA- Ivor Horton, Wiley, India
2. Dietal and Dietal , "Java: How to program", Prentice Hall
3. Stevan Jolzner, "JAVA Programming- Black Book", Dreamtech Press
4. ScriptDemics , "Learn to Master Java Programming", Staredu Solutions.

Course Name: Object Oriented Programming Lab

Course Code: ES05P

NEP Vertical_Basket: Engineering Science

Preamble:

The course aims to advance learner's knowledge in problem solving and programming principles for real world applications through object-oriented programming using Java language. The course emphasizes data abstraction and object-oriented programming design through the implementation of classes, objects and related concepts like Inheritance, Polymorphism, Exception Handling, Multithreading and Applets.

Pre-requisites:

Structured Programming Lab (ES04P)

Course Objectives:

- Impart hands on experience with java programming using JDK.
- Introduce programming platform like Eclipse, NetBeans, Visual Studio
- Train the students to write programs for solving real world problems using object-oriented methodology.
- Train the students to write web applications using applets in Java.

Course Outcomes:

Learner will be able to:
CO1: Develop procedure-oriented java applications using basic Programming Constructs and i/o.
CO2: Design java applications using class and objects.
CO3: Demonstrate the use of predefined classes like String, Math, Scanner, Vector etc.
CO4: Develop java application to implement the concept of inheritance and interfaces.
CO5: Demonstrate the need and use of exception handling and multithreading.
CO6: Develop simple web-based applications using applets.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

Sr.no.	Suggested Topic(s)	No. of experiments
1	Programs on Basic programming constructs like branching and looping	2
2	Program on accepting input through keyboard	2
3	Programs on class and objects	2
4	Program on method and constructor overloading.	2
5	Program on Packages	1
6	Program on String class	2
7	Program on String Buffer and Vectors.	2
8	Program on types of Inheritance.	1
9	Program on Multiple Inheritance. (interface)	1
10	Program on abstract class and abstract methods.	1
11	Program using super and final keyword.	1
12	Program on Exception handling.	2
13	Program on user defined exception.	1
14	Program on Multithreading.	2
15	Program on Graphics class.	1
16	Program on applet class.	1

Suggested List of Assignments:

1. Assignment on class and objects
2. Assignment on inheritance
3. Assignment on exception handling
4. Assignment on multithreading
5. Assignment on applets

Suggested List of Value-Added Home Assignments:

Practicing problem solving using Java on online coding challenge platforms like HackerRank, TopCoder

Suggested Online Courses:

1. Online course on Coursera : https://www.coursera.org/specializations/object-oriented-programming

2. Online course on Edx : https://www.edx.org/course/introduction-to-java-programming-starting-
    to- code?index=product&queryID=f7e6c0dd8a60ec2ad5fd69f3649948cb&position= 1&v=
    2&linked_from=autocomplete&c=autocomplete

Text Books:

1. Herbert Schildt, "JAVA: The Complete Reference", Oracle Press
2. Sachin Malhotra and Saurabh Chaudhary, "Programming in JAVA", Oxford University Press

Reference Books:

1. Ivor Horton, "Beginning JAVA", Wiley, India
2. Dietal and Dietal, "Java: How to program", Prentice Hall
3. Stevan Jolzner, "JAVA Programming- Black Book", Dreamtech Press
4. ScriptDemics, "Learn to Master Java Programming", Staredu Solutions.

Detailed Syllabus of Humanities, Social Science and Management and Liberal Learning Courses

Course Name: Effective Communication

Course Code: HS01T

NEP Vertical_Basket: Humanities, Social Sciences and Management

Preamble:

This course introduces learners to the basics of Effective Communication and English language usage which will equip them with the requisite skillset for higher studies and placements. It considers the important foundational aspects of communication skills and English proficiency required for the workplace. It acquaints the learners with modern communication tools and the basics of public speaking before an audience.

Pre-requisites:

Nil

Course Objectives:

- To enable learners to gain understanding of the cyclic process, methods, channels, and barriers of communication.
- To facilitate learners in developing the skills of active listening, impactful public speaking, reading strategies, and effective writing.
- To create awareness of strengthening English proficiency for competitive exam preparation and the art of comprehension and summarization.
- To introduce strategies for creating effective presentations using modern ICT enabled tools.

Course Outcomes:

Learner will be able to:

CO1: Use verbal/non-verbal cues at social and workplace situations by learning the basics of
     communication skills.
CO2: Employ listening strategies to become effective listeners and powerful speakers for speaking at
     social, academic, and business situations.
CO3: Improved verbal aptitude to be equipped for competitive examinations and placements.
CO4: Make effective presentations and present before an audience with confidence.
CO5: Use reading strategies for faster comprehension, summarization, and evaluation of texts.
CO6: Develop awareness of contemporary digital tools of communication.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Fundamentals of Communication	Concept, Elements and Cycle of Communication Methods of Communication (Verbal and Nonverbal) Objectives and Channels of Communication (Formal and Informal), Barriers to Communication: Physical, Mechanical, Psychological, Semantic, Socio-cultural, Cross-cultural	10
2	Listening & speaking	Techniques to improve Listening, Listening exercises, Speech writing and delivery. Different types of Speeches & Tips on Public Speaking	6
3	English Usage	Vocabulary Building (Etymology, Synonyms, Antonyms, One Word Substitutes) useful for TOEFL, GRE, Grammar Proficiency Tests (Articles, Prepositions, Tenses, Punctuation), Identifying Common Errors in Writing, Grammar Checkers and Sentence Correction Tools	4
4	Presentation Skills	Introduction to Presentation Skills, Creating Presentations-Content, Delivering Presentations before an audience, Using Presentation Software-Modern Presentation Tools	4
5	Comprehension & Summarization	Comprehension & Reading Strategies. Graphic Organizers (Mind Maps, Flow Charts, Tree Diagrams etc.). Summarization of technical passages within specified word limit	2
6	Communication Strategies for Virtual Age	Digital Content Creation, Infographics, ICT Tools, Social and Popular Media	4
Total			**30**

Suggested List of Assignments:

1. Written Assignment on Fundamentals of Communication (Individual)
2. Listening Activities and Exercises (Individual)
3. Aptitude test on Vocabulary and Grammar (Language Lab) (Individual)
4. Presentation on domain related topics (Group)
5. Comprehension & Summarization of technical passages
6. Digital Content Creation using ICT Tools

Suggested List of Value-Added Home Assignments:

1. https://www.udemy.com/course/professional-communication-and-business-writing**/** Udemy
2. https://www.udemy.com/courses/business/communications/ Udemy

Suggested Online Courses:

1. Courses on Communication offered by Udemy.
2. Business English for Non-Native Speakers Offered by The Hong Kong University of Science and Technology
   https://www.coursera.org/Specializations/Business English for Non-Native Speakers
3. English Communication Skills offered by University of Washington
   https://www.coursera.org/specializations/Business English Communication Skill
4. https://www.udemy.com/share/101wx6/Public Relations: Media Communication Crisis
5. https://www.udemy.com/share/101BkA/Basic English Grammar and Structures

Reference Books:

1. Raman Meenakshi and Sangeeta Raman, "Communication Skills", OUP, 2016.
2. Kumar Sanjay and Pushp Lata, "Communication Skills", OUP, 2011.
3. Murphy Herta, "Effective Business Communication", McGraw Hill, 2017.
4. Kitty O Locker, "Business Communication- Building Critical Skills", McGraw Hill, 2013.
5. Lehman, Dufrene, Sinha, "BCOM" Cengage Learning, 2020.
6. K. Alex, "Soft Skills", S.Chand and Company, 2014.
7. Stanton Nicky, "Mastering Communication", Palgrave Master Series, 2009.
8. Alan Pease, "Body Language", Manjul Publications, 2014.
9. A. Kaul, "Effective Business Communication", Prentice Hall of India, 2015.
10. Monippally, "Business Communication Strategies", Tata McGraw Hill, 2001.

Course Name: Effective Communication Lab

Course Code: HS01P

NEP Vertical_Basket: Humanities, Social Sciences and Management

Preamble:

This course introduces learners to the basics of Communication Skills and English Language usage which will equip them with the requisite skillset for higher studies and placements. It considers the important foundational aspects of Professional Communication and English Proficiency. It acquaints the learners with modern communication tools and the basics of public speaking before an audience.

Pre-requisites:

Nil

Course Objectives:

- To equip learners with Active listening with focus on content, purpose, main idea, tone and pronunciation.
- To enable learners, develop Fluent speaking in different contexts and situations.
- To develop presentation skills in social, academic and professional situations using ICT tools.
- To facilitate faster reading skills for effective comprehension in a variety of texts.

Course Outcomes:

Learner will be able to:
CO1: Listen and comprehend all types of spoken discourse successfully.
CO2: Speak fluently and make effective professional presentations.
CO3: Read large quantities of text in a short time to comprehend, summarize and evaluate content.
CO4: Present themselves professionally in social, academic and professional situations.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

1. Ice Breakers/Introduction/Aptitude Test/English Proficiency Test
2. Extempore Speech Practice Session
3. Prepared Speech
4. Group Presentations on current and relevant topics
5. Situational Dialogue Writing and Delivery
6. Skits/Role play on Methods of Communication and Barriers of Communication
7. English Usage Practice on Grammar and Vocabulary
8. Virtual Lab

Suggested Online Courses:

1. Courses on Communication offered by Udemy.
2. Business English for Non-Native Speakers Offered by The Hong Kong University of Science and Technology
3. Speak English Professionally: In Person, Online & On the Phone
   https://www.coursera.org/Specializations/Business English for Non-Native Speakers
4. https://www.coursera.org/learn/speak-english-professionally
5. Improve Communication with Genial.ly (Coursera Project)
6. https://www.udemy.com/share/101BkA/Basic English Grammar and Structures
7. Public Speaking with Canva (Coursera Project)

Reference Books:

1. Raman Meenakshi and Sangeeta Raman, "Communication Skills", OUP, 2016.
2. Kumar Sanjay and Pushp Lata, "Communication Skills", OUP, 2011.
3. Murphy Herta, "Effective Business Communication", McGraw Hill, 2017.
4. Kitty O Locker, "Business Communication- Building Critical Skills", McGraw Hill, 2013.
5. Lehman, Dufrene, Sinha, "BCOM" Cengage Learning, 2020.
6. K. Alex, "Soft Skills", S.Chand and Company, 2014.
7. Stanton Nicky, "Mastering Communication", Palgrave Master Series, 2009.
8. Alan Pease, "Body Language", Manjul Publications, 2014.
9. A. Kaul, "Effective Business Communication", Prentice Hall of India, 2015.
10. Monippally, "Business Communication Strategies", Tata McGraw Hill, 2001.

Course Name: Professional Skills

Course Code: HS02T

NEP Vertical_Basket: Humanities, Social Sciences and Management

Preamble:

The course will groom learners in the areas of developing professional etiquettes, building digital profiles, imbibing workplace ethics, and organizational behavior. This course will also be an essential guide in building business communication and soft skills concepts.

Pre-requisites:

Nil

Course Objectives:

- To introduce the concepts of the job application process and digital profile building.
- To create awareness of professional etiquettes and corporate culture in tune with 21st Century soft skills.
- To enable learners to enrich their personality through self-awareness and SWOT analysis and understand various interpersonal skills required for the workplace.
- To build the foundations of professional ethics and corporate social responsibility among learners.

Course Outcomes:

Learner will be able to:

CO1: Apply the traits of a suitable candidate for a job/higher education, upon being trained in the
   techniques of holding a group discussion, facing interviews, and writing resume.
CO2: Acquire basic proficiency in building a digital profile by demonstrating an awareness of
   professional and ethical responsibilities.
CO3: Understand the nuances of professional etiquettes and professionalism.
CO4: Enrich their personality through SWOT analysis, identify their personality traits and learning styles
CO5: Develop interpersonal skills to build effective professional relations.
CO6: Demonstrate awareness of contemporary issues, knowledge of ethical responsibilities and CSR.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Employment Skills	Job Application & Resume Writing Group Discussion Interview Skills Digital Profile Building (ePortfolio, LinkedIn)	10
2	Professional Etiquettes	Corporate Grooming and Workplace Etiquette Telephone Etiquette, Netiquettes Digital Footprints, social media, Personal Profile Privacy	4
3	Interpersonal Skills	Assertiveness, Negotiation Leadership, Team Building Problem Solving, Decision Making Cultural and Emotional Intelligence	6
4	Ethics	Introduction to Ethics Plagiarism and Online Plagiarism Checker Patents Trademark and Copyrights and GI – Geographical Indicators Professional Ethics Corporate Social Responsibility (CSR) –Information Confidentiality	4
5	Personality Enrichment	SWOT Analysis and JOHARI window Developing Positive Attitude Personality Types and Learning Styles Vision and Goal Setting Stress Management and Time Management	4
6	21st Century Skills	Creative Thinking Critical Thinking Collaboration and Communication	2
Total			**30**

Suggested List of Assignments:

2. Draft a Cover Letter and a Resume in response to a job vacancy advertisement (Individual)
3. Role plays and documentation on Professional Etiquettes (Group)
4. Role Play and documentation on Interpersonal Skills (Group)
5. Analysis of case studies on Ethics (Individual)
6. SWOT Analysis (Individual)
7. Assignment on 21st Century Skills (Group)

Suggested Online Courses:

1. LinkedIn Mastery: Creating an awesome profile - https://www.udemy.com/course/linkedin-mastery-creating-an-awesome-profile/
2. Soft Skills: The 11 Essential Career Soft Skills - https://www.udemy.com/course/soft-skills-the-11-essential-career-soft-skills/
3. Understanding Personality Types at Work - https://www.udemy.com/course/understanding-personality-types-at-work/
4. Speak English Professionally: In Person, Online & On the Phone - https://www.coursera.org/learn/speak-english-professionally
5. How to Write a Resume (Project Centered Course) https://www.coursera.org/learn/how-to-write-a-resume
6. Interviewing and Resume Writing in English Specialization https://www.coursera.org/specializations/english-interview-resume
7. Build Your Professional ePortfolio in English - https://www.coursera.org/learn/eportfolio-english

Reference Books:

1. Wallace and Masters, "Personal Development for Life and Work", Thomson Learning, 2021.
2. Dr. K.Alex, "Soft Skills", S. Chand and company, 2014.
3. Robbins Stephens, "Organizational Behaviour", Pearson Education, 2016.
4. Dorch, Patricia, "What Are Soft Skills?", Executive Dress Publisher, New York, 2013.
5. Francis Peter, "Soft Skills and Professional Communication", Tata McGraw Hill, 2019.
6. Kitty O Locker, "Business Communication- Building Critical Skills", McGraw Hill, Sixth Edition.
7. Chaturvedi and Chaturvedi, "Business Communication - Concepts Cases and Applications", Pearson, 2021.
8. Jones, "How to Speak Fluently", Indian Publishing House, 2021.

Course Name: Professional Skills Lab

Course Code: HS02P

NEP Vertical_Basket: Humanities, Social Sciences and Management

Preamble:

The course, Professional Skills for the Workplace, will groom students in the areas of developing professional etiquettes, building digital profiles, imbibing workplace ethics, and organizational behaviour. This course will also be an essential guide in building business communication and soft skills concepts.

Pre-requisites:

Nil

Course Objectives:

Student will be able to:
- Apply the traits of a suitable candidate for a job/higher education, upon being trained in the techniques of holding a group discussion, facing interviews, and writing resume.
- Acquire basic proficiency in building a digital profile on LinkedIn, etc. and demonstrate an awareness of professional etiquettes through role play.
- Develop interpersonal skills to build effective professional relations by participating in seminars and quizzes.
- Demonstrate awareness of contemporary issues, knowledge of ethical responsibilities and CSR through case studies.
- Enrich their personality through SWOT analysis, identify their personality traits and learning styles through diagnostic tests.
- Demonstrate awareness of 21st century skills through poster presentation and discussions.

Course Outcome:

Student will be able to:
CO1: Observe and participate in Group Discussions and Mock Interviews on the lines of campus placement training.
CO2: Build a digital profile by demonstrating awareness of a professional persona.
CO3: Identify various interpersonal skills through participation in presentations and role play.
CO4: Differentiate between ethical and non-ethical behaviour through analysis of case studies.
CO5: Identify their personality traits and learning styles through activities like SWOT analysis.
CO6: Demonstrate awareness of 4 C's relevant to 21st Century Skills.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested list of Practicals:

1. Icebreakers – Introducing others.
2. GD Practice Session 01
3. GD Practice Session 02
4. Final GD – ISA
5. Mock Interviews
6. Digital Profiling/ E-portfolio
7. Role Play on Professional Etiquettes
8. Quizzes on interpersonal skills
9. Case Studies on Ethics
10. Personality Enrichment – SWOT Analysis, JOHARI Window
11. Personality Enrichment - Identifying self-learning styles, MBTI test
12. Poster Presentation/Other activities on 21st Century Skills

Course Name: Design Thinking

Course Code: GECI01

NEP Vertical_Basket: Entrepreneurship/Economics/Management Courses (EEMC)

Preamble:

Design thinking is a powerful tool for rethinking and revitalizing strategy—and for driving organizational performance. By placing customers' needs at the center of a product, service, process, or business model, you can reframe strategic challenges and develop more effective solutions. Drawing on right-brained creativity and left-brained analytics, the course on design thinking enables you to broaden your strategic perspective, find novel opportunities for innovation, and keep your business moving forward.

Course Objectives:

- To impart Knowledge on the concept of Design Thinking
- To impart knowledge on the phases of Design Thinking
- To apply Design Thinking concepts

Course Outcomes:

Learner will be able to:
CO1: Understand the concepts of design thinking approaches.
CO2: Create design thinking teams and conduct design thinking sessions.
CO3: Apply both critical thinking and design thinking in parallel to solve problems.
CO4: Apply design concept to their daily work.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Tutorial	Theory	Tutorial
2	1	2	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory + Tutorial	50	-	50	100

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Design Thinking Overview	What is different about design thinking, Design thinking skills, Design thinking mindset, Principles of Design thinking
2	General Approaches to Design Thinking	The basics of Design thinking, Design thinking frameworks, Design thinking team, Design thinking workshops and meeting – Characteristics and types
3	Design Thinking approach in stages	Apply design thinking framework, empathize with customers/users, Define the problem, Ideate, Prototype, Test solution.
4	Design Thinking Techniques	Listening and emphasizing techniques – Engagement, Observation, showing empathy, Define and ideation techniques – Unpacking, Personas, Pattern recognition and connecting the dots, Prototype, and testing techniques – Types of prototypes, forms of testing in design thinking,
5	General Design Thinking Practices	Use of diagrams and maps in design thinking – empathy map, affinity diagram, mind map, journey map. Story telling techniques – Improvisation, scenarios, K-scripts
6	Adopt and AdaptDesign thinking	Cautions and pitfalls – assumptions, pitfalls and cautions in design thinking workgroups, best practices

Reference Books:

1. Tim Brown, "Change by Design - How Design Thinking Transforms Organizations and Inspires Innovations"
2. Larry J.Leifer, Michael Lewerick, and Patrick, "The Design Thinking Toolbox: A Guide to Mastering the Most Popular and ValuableInnovation Methods"

Course Name: Indian Constitution

Course Code: GEPS01

NEP Vertical_Basket: Indian Knowledge System (IKS)

Preamble:

This course introduces learners to the framework that demarcates fundamental political code, structure, procedures, powers, and duties of government institutions and sets out fundamental rights, directive principles, and the duties of citizens.

Pre-requisites:

Nil

Course Objectives:

- To understand what a constitution is and why it is necessary.
- To understand how the constitution embodies certain Ideals.
- To understand the importance of fundamental rights and duties.
- To understand the functioning of the Parliament.

Course Outcomes:

Learner will be able to:
CO1: Learner will be able to understand Indian constitution principles.
CO2: Learner will be able to co-relate with political system.
CO3: Learner will be able to pursue the values of civic life.
CO4: Learner will be able to exercise their rights and duties.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Introduction	Historical background of constitution, Philosophy of constitution
2	Citizenship	Citizenship at the commencement of the Constitution, Rights of citizenship of certain persons of Indian origin residing outside India, Persons voluntarily acquiring citizenship of a foreign State not to be citizens, Continuance of the rights of citizenship, Fundamental Duties
3	Fundamental Rights	Definition, Laws inconsistent with or in derogation of the fundamental rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Core issues (Uniform civil code, Article 370, Reservation)
4	Directive Principles of State Policy	Definition, Certain principles of policy to be followed by the State, Equal justice and free legal aid, Organisation of village panchayat, Right to work, to education and 10 public assistance in certain cases, Provision for just and humane conditions of work and maternity relief, Living wage, etc., for workers, Participation of worker; in management of industries, Uniform civil code for the citizens, Provision for free and compulsory education for children, Promotion of educational and economic interests of Scheduled Castes, Scheduled Tribes and other weaker sections, Protection and improvement of environment and safeguarding of forests and wild life, Protection of monuments and places and objects of national importance, Separation of judiciary from executive, Promotion of international peace and security
5	The Parliament	Constitution of Parliament, Composition of the Council of States, Composition of the House of the People, Duration of Houses of Parliament, Rights of Ministers and Attorney-General as respects Houses, Law making procedure, Amendment process and language
6	Judiciary	Establishment and Constitution of Supreme Court, High Courts for States, Subordinate Courts, Working of quasi – judicial bodies
7	Elections	Superintendence, direction and control of elections to be vested in an Election Commission, Power of Parliament.to make provision with respect to elections to Legislatures, Power of Legislature of a Slate to make provision with respect to elections to such Legislature Bar to interference by Couns in electoral matters
8	Landmark cases	Nanavati case, Shah Bano, Keshvanand BhartiVishakha Case etc

Recommended Online Courses:

1. Constitutional Studies
   https://onlinecourses.nptel.ac.in/noc20_lw03/preview
2. Constitution of India
   https://www.udemy.com/course/constitution-of-india/

Reference Books:

1. D.C. Gupta, "Indian Government and Politics"
2. D.D. Basu, "Introduction to the Constitution of India"
3. P. M. Bakshi, "The Constitution of India"
4. M. V. Pylee, "Constitutional History of India"

Course Name: Universal Human Values

Course Code: GESB02

NEP Vertical_Basket: Value Education Courses (VEC)

Preamble:

The present education system has become largely skill based. The prime emphasis is on science and technology. However, science and technology can only help to provide the means to achieve what is considered valuable in terms of facilities. Value Education is a crucial missing link in the present education system. Because of this deficiency, most of our efforts may prove to be counterproductive and serious crises at the individual, societal and environmental level are manifesting.

Values and skill complement each other. Values mean importance or participation and skills mean qualities, training, and capabilities. To fulfil our aspirations both values and skills are necessary. When we identify and set the right goals and produce in right direction, this is known as value domain, the domain of wisdom. Basically, we must know what really is useful to achieve human happiness, the happiness to all and for all the time.

And when we learn and practices to actualize this goal to develop the techniques to make this happen in real life, in various dimensions of human Endeavour, this is known as domain of skills. Hence, there is an essential bonding between values and skills for the success of any human endeavor.
For a happy and successful life, it is important to know, explore, verify and practice universal human values, professional ethics.

Prerequisite:

Nil

Course Objectives:

- To help the student to see the need for developing a holistic perspective of life.
- To sensitize the student about the scope of life – individual, family, society and nature/existence.
- Strengthening self-reflection.
- To develop more confidence and commitment to understand, learn and act accordingly.

Course Outcomes:

Learner will be able to:
CO1: Learner will become more aware of themselves and their surroundings.
CO2: Learners will be more responsible in life and will be able to handle critical problems.
CO3: Learners will develop better critical ability.
CO4: Learners will be more sensible towards commitment.
CO5: Learner will be able to apply human values in day-to-day life.
CO6: Learner will become a responsible citizen.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Introduction to Value Education	Need for Value Education Basic guidelines for Value Education The Content of Value Education The Process of Value Education Starting to observe inside What is Self-exploration? What is its Purpose? Content of Self-exploration Process of Self-exploration Natural Acceptance What is the State today? What is the way out? What do we need to do?
2	The Basic Human Aspirations Continuous Happiness and Prosperity	Continuous Happiness and Prosperity Our Basic Aspirations Exploring Happiness and Prosperity A Look at the Prevailing Notions of Happiness and Prosperity Some Possible Questions/Confusions Basic Requirements for Fulfilment of Human Aspirations What is our State today? Why are we in this State? - Living with Wrong Assumptions What is the Solution? The Need for Right Understanding Our Program: Understand and Live in Harmony at all Levels of Living Our State today Our Natural Acceptance for Harmony at all Levels of our Living Human and Animal Consciousness
3	Understanding the Human Being as Co-	Human Being is more than just the Body Understanding Myself as Co-existence of the Self and the Body

	existence of Self ('I') and Body	Understanding Needs of the Self and Needs of the Body
		Understanding the Activities in the Self and the Activities in the Body
		Understanding the Self (I) as the Conscious Entity, the Body as the Material Entity
		Exercise on distinguishing Needs of the Self ('I') and Body
		Exercise on Distinguishing Activities of the Self (I) and Body
		Understanding the Body as an Instrument of 'I' ('I' being the Seer, Doer and Enjoyer)
		Why should I study Myself?
		Getting to know the Activities in the Self (I)
		How are the Activities in T Related!
		The Activities in 'I' are Continuous
		Effects of the Problem....
		What then is the Solution?
		Result of Realization and Understanding Living with Definiteness
		Our Body A Self-organized Unit
		Harmony of T with the Body: Sanyama and Svasthya
		What is our State today?
		What is the way out?
		Understanding and Living with Sayama
		Correct Appraisal of our physical needs
4	Harmony in the Family, Society, Nature- Understanding Values in Human Relationships	Family as the Basic Unit of Human Interaction
		Harmony in the Family.
		Justice (Nyaya)
		What is the State today?
		Values in Human Relationships
		Trust (Visvasa), Respect (Sammana), The Basis for Respect
		Assumed Bases for Respect Today
		The Problems due to Differentiation
		Difference between Attention' and 'Respect'
		What is the way out?
		Affection (Sneha), Care (Mamand), Guidance (Vatsalya), Reverence (Shraddha), Glory (Gaurava), Gratitude (Kritagayta), Love (Prema)
		Harmony from Family to World Family: Undivided Society
		Extending Relationship from Family to Society
		Identification of the Comprehensive Human Goal
		Where are we today?
		Programs Needed to Achieve the Comprehensive Human Goal: The Five Dimensions of Human Endeavour
		Education-Right Living (Siksha Sanskara)
		Health-Self-regulation (Svasthya-Sanyama)
		Justice-Preservation (Nyaya-Suraksha)
		Production-Work (Utpadana-Karya)
		Exchange-Storage (Vinimaya-Kosa)

		What is our State today?
		Harmony from Family Order to World Family Order: Universal Human Order
		The Four Orders in Nature
		Interconnectedness and Mutual Fulfilment (Parasparta aur Paraspara Purakata)
		Recyclability and Self-regulation in Nature
		Understanding the Four Orders
		Things (Vastu), Activity (Kriya), Innateness (Dharana), Natural Characteristic (Sabha), Basic Activity, Conformance
		Human Beings-our State today
		What is way out
5	Implications of the Right Understanding	Values in Different Dimensions of Human Living
		Universal Values naturally emerging from the Right Understanding
		Definitiveness of Ethical Human Conduct
		Identification of Snama leading to Svatantrata and Swarajya
		Development of Human Consciousness
		Implications of Value-based Living
		Identification of Comprehensive Human Goal
		Vision for the Holistic Alternative
		Basis for Humanistic Education and Humanistic Constitution
		Universal Human Order and its Implications
6	Professional Ethics Journey towards the Holistic Alternative	Profession-In the Light of Comprehensive Human Goal
		Ensuring Competence in Professional Ethics- The current Scenario
		Inherent Contradictions and Dilemmas and their Resolution
		Appreciating the Need for Self-Exploration
		Facilitating the Understanding of Harmony at various Levels
		Steps for Evolution at the Individual Level
		Steps for Transition at the Level of Family Society and Profession
		Promoting Mass Awareness and moving towards Humanistic Education
		Evolving Holistic Models of Living
		Amending Policies, Programs and Social Systems in tune with Comprehensive Human Goal
		Is the Transition too Difficult?
		Concluding Remarks

Reference Books:

1. A Foundation course in Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria Excel books.

Course Name: Indian Traditional Knowledge System

Course Code: GESB03

NEP Vertical_Basket: Indian Knowledge System (IKS)

Preamble:

India has a vast tradition of Sanskrit texts dealing with various scientific thoughts. Number of treatises on the topics like Agriculture, Animal Husbandry, Chemistry, Astronomy, Mathematics, Botany, etc. focus on the development of thoughts in the concerned area.
This course aims at introducing a student with various treatises on physical as well as social sciences and their contribution to modern branches of sciences. Taking into consideration the vast scope of these sciences, major treatises will be introduced in the course thereby making a student to ponder over the ancient knowledge systems of India.

Pre-requisites:

NIL

Course Objectives:

- The objective of this course is to facilitate the learners with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system.
- It aims at imparting basic principles of thought process, reasoning, and inference.

Course Outcomes:

Learner will be able to:
CO1: Understand and the rich history of Indian knowledge system.

CO2: Understand the different areas of contribution from India.

CO3: Apply the different principals of traditional knowledge in modern systems.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Review of Scientific Literature in Sanskrit	References of sciences/scientific knowledge through different textual sources etc.
2	Chemistry and Mathematics	Various treatises on Chemistry, Use of chemistry in medicines, Metallurgy, Use of chemistry for occult practices, Mathematical concepts through Shulbasutras, Development of different mathematical branches and treatises based on that, Development of astronomy, etc.
3	Dietetics	Study of different texts based on culinary art Nalapakadarpana, Bhojanakutuhalam, Supashastra, Modes of preservation of food, Dietary guidelines through branches of Ayurveda, Food and diseases, etc.
4	Agriculture, Astronomy, and Zoology	Study of krishisuktas, Krishiparashara, Brihatsamhita, Types of crops, Manures, Types of land- devamatruka, nadimatruka, Indian Astronomy, Use of animals in warfare, Animal husbandry, Animals for medicines, etc.

Reference Books:

1. Nirmal Trikha, "Scientific Knowledge in Sanskrit Literature"
2. S. Balachandra Rao, "Indian Astronomy: An Introduction"
3. B. Seal, "Ancient Indian Sciences"
4. Melissa Stewert, "Science in Ancient India (Science of the Past)"
5. Sudheer Birodkar, "India's Contribution to World Culture"
6. R. C. Majumdar, "Ancient India"
7. Swami ChidatmanJee Maharaj, "Ancient Indian Sciences"
8. Stella Kramrisch, "The Art of India through the Ages"
9. K.Krishna Murthy, "Early Indian Secular Architecture"

Course Name: Voice Culture for Professional Speaking

Course Code: GEA01

NEP Vertical_Basket: Ability Enhancement Courses (AEC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

Nil

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world
- To develop the ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Voice Culture for Professional Speaking	Introduction to Voice, Do's and don'ts for voice, General Reading session, Review of reading session. Good posture exercise, Relaxing the mind exercise, Tongue stretching exercise, breathing exercise or good fuller voice. Resonance, Improving resonance, voice clarity exercise, accent. Reading session – voice projection, understanding personality – traits, emotions, body language. Nonverbal communication, Thoughts – positive, negative and their effect on voice. Listening skill and exercise. Voice modulation, pitch, volume, tone, stress, speed, rhythm. Pronunciation – The Indian accent way, Presentation skills

Recommended Online Courses:

Nil

Reference Books:

As suggested by resource person in session

Course Name: Financial Management for beginners

Course Code: GEF02

NEP Vertical_Basket: Entrepreneurship/Economics/Management Courses (EEMC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

Nil

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world
- To develop the ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values   .

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by

a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Financial Management for beginners	Overview of Economics, macroeconomics, microeconomics, Money and its flow Overview of Share Market, Primary market, secondary market, nature of trading, scrips for short term and long-term investment Modes of Investments, Debt, equity, gold, property, assessment of investment type. Mutual Funds, Fund houses, mutual fund schemes, SIP, Magic of compounding Crypto and its future, maximum asset allocation in crypto Growing sectors from Engineering perspective

Recommended Online Courses:

Nil
Reference Books:

As suggested by resource person in session

Course Name: Four Pillars of Democratic Nation

Course Code: GEPS02

NEP Vertical_Basket: Value Education Courses (VEC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

Nil

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world
- To develop the ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Four Pillars of Democratic Nation	The term 'Democracy', History of democracy, Indian Democracy, Responsibility of good citizen. Legislature – Six major functions of legislature Executive - President, Vice-President, Prime Minister, Cabinet Minister, Secretaries, and Civil services Judiciary – Indian Juridical system, Indian Constitution, Court structure Media - The basic right of freedom of speech and expression, Print Media and digital media

Recommended Online Courses:

Nil

Reference Books:

As suggested by resource person in session

Course Name: Railways – Wonders of Infrastructure

Course Code: GEWI01

NEP Vertical_Basket: Value Education Courses (VEC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

NIL

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world
- To develop ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by

a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Railways – Wonders of Infrastructure	History of civilization, Industrial revolution, early-stage steam engine, steam powered locomotives Liverpool to Manchester railways, Economic changes brought by railways. Indian Railways, Land and bridges, electrification, telecommunication, public sector undertakings, Reforms in railway sector.

Recommended Online Courses:

Nil

Reference Books:

As suggested by resource person in session

Course Name: IQ vs EQ

Course Code: GEPEW02

NEP Vertical_Basket: Co-curricular Courses (CC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

Nil

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world
- To develop the ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	IQ vs EQ	Introduction to Emotional Intelligence, the ability to understand, use, and manage your own emotions in positive ways to relieve stress, communicate effectively, empathize with others, overcome challenges and defuse conflict. Applications of EQ skills for mental health and wellbeing, self-awareness, self-motivation, active listening. The EQ view and Neuroscience of emotional intelligence, Intrinsic motivation and goal setting

Recommended Online Courses:

Nil

Reference Books:

As suggested by resource person in session

Course Name: Facets of Astronomy

Course Code: GENS01

NEP Vertical_Basket: Co-curricular Courses (CC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

Nil

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world
- To develop the ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Facets of Astronomy	Astrophysics: applying the laws of physics in space. Astrometry: mapping celestial bodies. Astrogeology: examining rocks, terrain, and material in space. Astrobiology: Searching for life outside Earth. Use of physics, mathematics, chemistry in astronomy Types of telescopes, Refractor Telescopes. Reflector Telescopes. Dobsonian Telescopes. Maksutov-Cassegrain Telescopes. The scientific study of celestial objects visible at night, Various celestial objects to observe.

Recommended Online Courses:

Nil

Reference Books:

As suggested by resource person in session

Course Name: Various dance forms

Course Code: GEA02

NEP Vertical_Basket: : Co-curricular Courses (CC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

Nil

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world.
- To develop the ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Various dance forms	Dance, Definition, History, music, rhythm. Basic understanding of the term ABHINAYA and definition of its four aspects. Technical terminology of dance. Acquaintance with the traditional costumes. Dance forms: Indian Classical dance, folk dance, Bollywood, Jazz and performances

Recommended Online Courses:

Nil

Reference Books:

As suggested by resource person in session

Course Name: Responsibility towards sustainable environment

Course Code: GESB06

NEP Vertical_Basket: Value Education Courses (VEC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

Nil

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world.
- To develop the ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a

panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Responsibility towards sustainable environment	Sustainability, Pillars of sustainability, social equity, economic development, environmental protection, cultural/human sustainability. Sustainable development, United nation's sustainable development goals. Sustainable Environment, long term health of ecosystem, renewable resources, Global warming, protection of species diversity and ecological structure, Low carbon economy. Being responsible towards sustainable environment, dos and don'ts, Smart City – city functions, economic growth, quality of life, technology used.

Recommended Online Courses:

Nil

Reference Books:

As suggested by resource person in session

Course Name: Nutrition and Physical Wellness

Course Code: GEPEW03

NEP Vertical_Basket: Co-curricular Courses (CC)

Preamble:

This course introduces learners with an aim to focus on holistic personality development, a wide platter of General Education courses are offered to First Year Engineering students. These courses will also help to create balance in the brain hemispheres and thereby improve learners' clarity in thoughts and responses.

Pre-requisites:

Nil

Course Objectives:

- To develop the intellectual skills and competencies necessary to participate effectively in society and the world.
- To develop broad knowledge of living and non-living world
- To develop the ability to integrate knowledge, make informed ethical decisions and accept civic responsibilities.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate effective oral communication.
CO2: Demonstrate the ability to think critically and creatively.
CO3: Apply quantitative reasoning concepts and skills to solve problems.
CO4: Illustrate the ability to self-reflect and access relevant ethical values.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	50	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide his/her assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a

panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content
1	Nutrition and Physical Wellness	Nutrition, Types of nutrition, Human need, Carbohydrates, proteins, vitamins, water, fats, minerals Well-balanced diet and its advantages Physical activities, daily exercises, need of stretching in working hours, best time and duration for physical activities, risk of taking supplements, dangers of following harmful fads. Physical wellness, finding time to move your body, warning sign by body, maintaining regular sleep schedule, maintaining ideal weight.

Recommended Online Courses:

Nil

Reference Books:

As suggested by resource person in session

Appendix-A

Subcategories and list of courses under HSSM (Humanities Social science and Management)

I.   **Ability Enhancement Courses**

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	GE01$	Internship with other Institutes (Credit Transfer)	-	120 hrs	-	4	Any Semester
2	HS01T*	Effective Communication	2	-	-	2	
	HS01P*	Effective Communication Lab	-	2	-	1	
3	HS03	Technical and Business Writing Lab	1	2	-	2	
4	GEA01	Voice Culture for Professional Speaking	2	-	-	2	
5	GESB04	Corporate and Social Etiquettes	2	-	-	2	

II.   **Entrepreneurship/Economics/Management Courses**

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	GECI01	Design Thinking	2	-	-	2	Any Semester
2	GECI02	Innovation and Entrepreneurship	1	-	-	1	
3	GEF01	Basics of Finance & Legal aspects for Business	2	-	-	2	
4	GEF02	Financial Management for beginners	2	-	-	2	
5	HS06	Principles of Economics and Management	2	-	1	3	

III.   **Indian Knowledge System (IKS)**

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	GEA03	Exploring Indian Art	2	-	-	2	2

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
2	GESB03	Indian Traditional Knowledge System	2	-	-	2	2
3	GEPS01	Indian Constitution	2	-	-	2	2

IV.   Value Education Courses (VEC)

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	GESB02	Universal Human Values	2	-	-	2	Any Semester
2	GESB06	Responsibility towards sustainable environment	2	-	-	2	
3	GEPS02	Four Pillars of Democratic Nation	2	-	-	2	
4	GEWI01	Indian Railways - Wonders of Infrastructure	2	-	-	2	

List of co-curricular courses under LLC (Liberal Learning Courses)

Co-curricular Courses (CC)

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	GEA02	Various Dance Forms	2	-	-	2	1/2
2	GESB05	Global Citizenship Education	2	-	-	2	1/2
3	GEPEW01	Wellness – Body, Mind & Spirit	2	-	-	2	1/2
4	GEPEW02	IQ vs EQ	2	-	-	2	1/2
5	GEPEW03	Nutrition and Physical Wellness	2	-	-	2	1/2
6	GENS01	Facets of Astronomy	2	-	-	2	1/2