Vivekanand Education Society's
Institute of Technology

(Autonomous Institute Affiliated to University of Mumbai, Approved by AICTE & Recognized by Govt. of Maharashtra)
NAAC accredited with 'A' Grade

Department of Humanities & Applied Sciences

Department of Humanities and Applied Sciences

Syllabus (NEP Scheme)

First year Bachelor of Engineering(B.Tech)

Sem-I & Sem II

w.e.f. A.Y. 2024-25

Group B

Artificial Intelligence and Data Science

Electronics and Telecommunications

Electronics and Computer Science

Automation and Robotics

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Department of Humanities & Applied Sciences

Semester I Scheme

Group B (AI & DS, EXTC, ETCS, AU & RO)

Course Type	Course code	Course Name	Teaching Scheme (Contact hrs)			Credits Assigned			
			Th	Pr	Tut	Th	Pr	Tut	Total
Basic Science Course (BS)	NBS11	Fundamentals of Engineering Mathematics-1	02	--	01	02	--	01	03
Basic Science Course (BS)	NBS13	Engineering Chemistry	02	02	–	02	01	--	03
Basic Science Course (BS)	NBS14	Biology for Engineers	02	--	–	02	--	--	02
Engineering Science Course (ES)	NES14	Fundamentals of Programming (C/Java)	03	02	–	03	01	--	04
Programme Core Course (PC)	NPC11	Programme Core Course	02	–	–	02	–	–	02
	NPC12								
	NPC13								
	NPC14								
Indian Knowledge System (IK)	NIK11	Fundamentals of Vedic Mathematics	02	--	–	02	--	--	02
Value Education (VE)	NVE11	Universal Human Values-1	02	--	--	02	--	--	02
Vocational/Skill Enhancement course (VS)	NVS11	Basic Workshop Practice	–	04	–	–	02	–	02
Co curricular Activity (CC)	NCC11	Co curricular Course	--	04	--	–	02	--	02
Total Credit									**22**

Tutorials to be conducted batchwise

NPC11-Programme Core Course for AI & DS- Digital logic and Computer Organization & Architecture
NPC12- Programme Core Course for EXTC-Digital System
NPC13- Programme Core Course for ETCS-Digital Electronics
NPC14-Programme Core Course for AU & RO-Electronic measurement and instrumentation
NES14-Fundamentals of Programming-OOPM (JAVA Programming)(AI & DS)
NES14-Fundamentals of Programming-C Programming)(EXTC, ETCS and AU & RO)

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Semester I Marks Scheme

Group B (AI & DS, EXTC, ETCS, AU & RO)

Course Type	Course code	Course Name	TH	MT	CA	TW	PR/ OR	Total
Basic Science Course (BS)	NBS11	Fundamentals of Engineering Mathematics-1	60	20	20	--	–	100
Basic Science Course (BS)	NBS13	Engineering Chemistry	60	20	20	25	–	125
Basic Science Course (BS)	NBS14	Biology for Engineers	60	20	20	--	–	100
Engineering Science Course (ES)	NES14	Fundamentals of Programming (C/Java)	60	20	20	25	–	125
Programme Core Course (PC)	NPC11 NPC12 NPC13 NPC14	Programme Core Course	60	20	20	–	–	100
Indian Knowledge System (IK)	NIK11	Fundamentals of Vedic Mathematics	–	–	20	--	–	20
Value Education (VE)	NVE11	Universal Human Values-1	-	-	20	--	–	20
Vocational/Skill Enhancement course (VS)	NVS11	Basic Workshop Practice	–	–	–	50	–	50
Co curricular Activity (CC)	NCC11	Co curricular Course	–	–	–	–	25	25
Total Marks								665

NPC11-Programme Core Course for AI & DS- Digital logic and Computer Organization & Architecture
NPC12- Programme Core Course for EXTC-Digital System
NPC13- Programme Core Course for ETCS-Digital Electronics
NPC14-Programme Core Course for AU & RO-Electronic measurement and instrumentation
NES14-Fundamentals of Programming-OOPM (JAVA Programming)(AI & DS)
NES14-Fundamentals of Programming-C Programming)(EXTC, ETCS and AU & RO)

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Semester II Scheme									
Course Type	Course code	Course Name	Teaching Scheme (Contact hrs)			Credits Assigned			
			Th	Pr	Tut	Th	Pr	Tut	Total
Basic Science Course (BS)	NBS21	Fundamentals of Engineering Mathematics-2	02	--	01	02	--	01	03
Basic Science Course (BS)	NBS22	Engineering Physics	02	02	–	02	01	--	03
Engineering Science Course (ES)	NES21	Engineering Mechanics	02	--	–	02	--	--	02
Engineering Science Course (ES)	NES22	Engineering Drawing	–	02 (DH)+ 02(AutoCAD)	–	–	02	--	02
Engineering Science Course (ES)	NES23	Basic Electrical Engineering	03	02	–	03	01	--	04
Ability Enhancement Course (AE)	NAE21	Professional Communications and Ethics-I	01	--	02	01	--	01	02
Value Education (VE)	NVE22	Universal Human Values-2	02	--	--	02	--	--	02
Co curricular Activity (CC)	NCC22	Co curricular Course	--	04	--	–	02	--	02
Total Credits									20

Tutorials to be conducted batchwise

** Instructions should be conducted for the entire class*

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Department of Humanities & Applied Sciences

Semester I Marks Scheme								
Course Type	Course code	Course Name	TH	MT	CA	TW	PR/ OR	Total
Basic Science Course (BS)	NBS21	Fundamentals of Engineering Mathematics-2	60	20	20	--	–	100
Basic Science Course (BS)	NBS22	Engineering Physics	60	20	20	25	–	125
Engineering Science Course (ES)	NES21	Engineering Mechanics	60	20	20	--	–	100
Engineering Science Course (ES)	NES22	Engineering Drawing	–	–		25	25	50
Engineering Science Course (ES)	NES23	Basic Electrical Engineering	60	20	20	25	–	125
Ability Enhancement Course (AE)	NAE21	Professional Communications and Ethics-I	–	20	80	--	–	100
Value Education (VE)	NVE22	Universal Human Values-2	-	-	20	--	–	20
Co curricular Activity (CC)	NCC22	Co curricular Course	–	–	–	–	25	25
Total Marks								645

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Department of Humanities & Applied Sciences

Semester I

Syllabus

Group B

Artificial Intelligence and Data Science

Electronics and Telecommunications

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COURSE NAME : FUNDAMENTALS OF ENGINEERING MATHEMATICS-1

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
NBS11	Fundamentals of Engineering Mathematics-1 (Theory)	02	---	01*	02	---	01	03

Fundamentals of Engineering Mathematics-1(Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NBS11	Fundamentals of Engineering Mathematics-1 (Theory)	02	---	01*	02	---	01	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NBS11	Fundamentals of Engineering Mathematics-1 (Theory)	20	20	60	---	---	100

Tutorials to be conducted batchwise

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Course Prerequisite: Matrices and Matrix Operations,Algebraic Properties of Matrices,Method for Finding inverse of a matrix- By elementary transformation and by adjoint of a matrix, Types of real matrices, Basics of Differentiation,Basics of Differential Equations	
Course Objectives:	
1	To provide students with contemporary knowledge about different types of Matrices and their Ranks
2	To learn about concept and applications of complex numbers
3	To explore the solution methods using Partial derivatives and its concepts.
4	To apply concept of Partial differentiation to find extreme values of a function
5	To learn about solution methods of first order and first degree ordinary differential equations
Course Outcomes:	
1	Students would develop the ability to understand and work with real and complex matrices, their properties, ranks and apply these concepts to solve problems in various fields.
2	Students should be introduced to complex functions and their properties. Also understand the concept of using De' Moivre's application to find roots and power of complex numbers.
3	Students are able to gain an overview of partial derivatives which is used for solving various engineering problems.
4	Student would develop the ability to apply concept of partial differentiation to find extreme values of a function.
5	Students would develop the ability to analyze and solve first order and first degree ordinary differential equations, apply mathematical techniques to interpret the solutions in the context of the problem.

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Module		Content	Hrs
1		**Matrices and its application**	6
	1.1	**Real and Complex Matrices**: Orthogonal Matrices, Symmetric Matrices, Skew-symmetric matrices, Hermitian, Skew-hermitian Unitary matrices (Properties and Examples)	
	1.2	**Rank of a Matrix:** Elementary Matrices ,rank of a matrix by Echelon form and Normal form	
	1.3	Introduction to Non- Homogeneous Systems of Linear Equations: consistency and solution	
	1.4	Introduction to Systems of Homogeneous Linear Equations: consistency and solution	
2		**Complex Number I**	10
	2.1	Powers and Roots of complex numbers (Applications of De' Moivre's theorem)	
	2.2	Circular and Hyperbolic Functions of Complex Numbers, logarithm of complex number, Separation into real and imaginary parts for all functions	
3		**Partial Derivatives**	4
	3.1	Functions of Several Variables,Partial Derivatives,The Chain Rule	
	3.2	Euler's theorems on homogeneous functions with two independent variables with proof deductions from Euler's theorem and examples (Two variables)	
4		**Applications of Partial Differentiation**	2
	4.1	Extreme Values and Saddle Points, Maxima and Minima	
5		**Differential Equations of first order and first degree**	6
	5.1	Exact differential equations,Equations reducible to exact equations by integrating factors.	
	5.2	Linear differential equations, Equation reducible to linear form, Bernoulli's equation.	
		Total	28

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Textbooks:	
1	R.K.Jain and S.R.K.Iyengar "Advanced Engineering Mathematics",Alpha science International Ltd.
2	Advanced Engineering Mathematics, H.K Dass,S. Chand Publications
Reference Books:	
1	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, Inc
2	B.S. Grewal, " Higher Engineering Mathematics",Khanna Publication
3	George B. Thomas, Weir & Hass, "Thomas' Calculus",Pearson
4	George F. Simmons, "Differential Equations with Application", Tata Mc. Graw Hill Edition
5	Howard Anton, Chris Rorres,"Elementary Linear Algebra",wiley Publication

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of 20 marks. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks

7	Participation in event/workshop/talk / competition followed bysmall report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

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Department of Humanities & Applied Sciences

COURSE NAME: ENGINEERING CHEMISTRY

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NBS13	Engineering Chemistry (Theory)	02	---	---	02	---	---	02
NBS23	Engineering Chemistry (Lab)	---	02	---	---	01	---	01

Engineering Chemistry (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NBS13	Engineering Chemistry (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NBS13	Engineering Chemistry (Theory)	20	20	60	---	---	100

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Course Objectives:	
1	The course is aimed to develop the basic skills of engineering students 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.
Course Outcomes:	
1	Thermodynamics-:To understand basic concepts of thermodynamics & implement it on relative topics in other modules like fuel.
2	Water-:Analyze the quality of water and suggest suitable methods of treatment
3	Fuel-:Explain the knowledge of determining the quality of fuel and quantify the oxygen required for combustion of fuel.
4	Corrosion**-:** Explain the concept of electrode potential and nernst theory and relate it to electrochemical cells. Identify different types of corrosion and suggest control measures in industries.

Engineering Chemistry (Lab)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
NBS23	Engineering Chemistry (lab)	---	02	---	---	01	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NBS23	Engineering Chemistry (lab)	---	---	---	25	–	25

Lab Outcomes	
1	Determine Chloride content and hardness of water sample
2	Determine the hardness of a given sample of water by complexometric titration using EDTA.

3	Determine metal ion concentration of given sample solution using colorimeter.
4	Synthesize UF, PF polymers.
5	Determine the moisture content of the given coal sample.
6	Measure the saponification number of given oil samples.
7	Determine the acid value of the given oil sample.

Engineering Chemistry (Theory)

Module	Content	Hrs
1	**Thermodynamics** Thermodynamic terms & basic concepts, System,boundary, surrounding, homogeneous and heterogeneous system, types of thermodynamic system (isolated, closed, open), Intensive & extensive properties, equilibrium, nonequilibrium states, Thermodynamic processes (adiabatic, isothermal, isobaric, isochoric), Reversible & irreversible processes, Units of heat and work, sign and convention of heat & work, Pressure, volume work, Isothermal reversible expansion work, Isothermal irreversible expansion work, Maximum work done in reversible expansion, Units of internal energy, 1st law of thermodynamics, Enthalpy of system, Units & sign convention of enthalpy, Relation between ΔH & ΔU, Heat Capacity, Molar heat capacity at constant volume, Molar heat capacity at constant pressure, Relation between ΔE & ΔH, Exothermic and Endothermic Reaction, Enthalpy of a reaction, Calculation ΔE & ΔH, Heat of reaction/enthalpy of reaction, Heat of Formation, Heat of Combustion, Hess's Law, Numericals related to the topics.	**6 Hrs**
2	**Water** Introduction-Impurities in water, hardness of water-units, types and numerical problems, determination of hardness of water by EDTA method and numericals, Softening of water by an Ion Exchange process and numericals, BOD, COD- definition, significance and numericals, Water purification-membrane technology-: Electrodialysis, Reverse Osmosis and Ultrafiltration	**6 Hr**
3	**Fuel** Definition, classification, characteristics of a good fuel, units of heat, Calorific value-Definition, Gross or Higher calorific value and Net or lower calorific value, Dulong's formula and numericals for calculations of Gross and Net Calorific Values Solid fuels-Analysis of coal-Proximate and Ultimate Analysis-numericals and significance Liquid fuels-Petrol-knocking, Octane Number, Cetane number, Anti Knocking agents, unleaded petrol, oxygenates (MTBE), catalytic converter Combustion-calculation for requirement of oxygen and air (by weight and by volume only for given fuels.)	**6 Hr**
4	**Corrosion**	**6 Hr**

	Definition, Mechanism of Corrosion-(i) Dry / Chemical Corrosion- (a) Due to Oxygen (b) Due to other gasses (ii) Wet/ Electrochemical Corrosion- Mechanism (a) Evolution of hydrogen (b) Absorption of oxygen gas Types of Corrosion- Galvanic Cell Corrosion, Concentration Cell Corrosion, Pitting Corrosion, Intergranular Corrosion, Stress Corrosion Factors affecting the rate of corrosion-(i)Nature of metal, (ii) Nature of corroding environment Methods of corrosion control-Material selection and proper designing, Cathodic protection-(i)Sacrificial anodic protection, (ii) Impressed current method, Metallic coatings-cathodic coating (Tinning) and anodic coating (Galvanizing)	
	Total	**24**

Reference Books:	
R1	Engineering Chemistry - Jain & Jain (Dhanpat Rai)
R2	Engineering Chemistry – Dara & Dara (S Chand)
R3	A Text Book of Engineering Chemistry – Shashi Chawla (Dhanpat Rai)

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks

8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five needs to be solved.

Engineering Chemistry (Lab)

Suggested Experiments: Students are required to complete at least 10 experiments.	
Star (*) marked experiments are compulsory.	
Sr. No.	**Name of the Experiment**
1	To determine Chloride content of water by Mohr's Method.
2	To determine total, temporary and permanent hardness of water sample by EDTA
3	To determine metal ion concentration using a colorimeter.
4	Synthesis of polymers
5	To determine the moisture content of the coal
6	To determine the saponification number of oil.
7	To determine the acid value of the oil

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructor to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that, the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Term Work:	
1	Term work should consist of 10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.

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3	Total 25 Marks (Experiments: 15-marks, Term work Assessment: 10-marks)

COURSE NAME: BIOLOGY FOR ENGINEERS

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NBS14	Biology for Engineers (Theory)	02	---	---	02	---	---	02

Biology for Engineers (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NBS14	Biology for Engineers (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NBS14	Biology for Engineers (Theory)	20	20	60	---	---	100

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Course Objectives:	
1	To introduce the students to the basic concepts of biological systems.
2	To provide awareness about the similarity between human systems and machines.
3	To motivate for applying technology for challenges in biological systems
Course Outcomes: On successful completion of course learner/student will be able to:	
1	Describe the basic working of human cell and bio-signal generation
2	Describe the fundamentals of human nervous system
3	Identify the similarity between human neural system and artificial neural system
4	Explain the development of artificial assist devices mimicking human sense organs

Biology for Engineers (Theory)

Module	**Content**	**Hrs**
Prerequisite: Knowledge of various biological systems.		
1	**Need of Biology for engineers** Role of Biology in Next Generation Technology Development – Cell Structure, Cell Potential, Action Potential, Bio-signals such as ECG, EEG and EMG and their specifications.	**06**
2	**Fundamentals of Human nervous system** Nervous system- Nerve cell, neuronal communication, nerve-muscle physiology, Central Nervous system, Peripheral nervous system, Brain and its lobes, Brain centres, Brain plasticity and accelerated learning *.	**06**
3	**Artificial Neural Network** Comparison of human neuron with artificial neuron, Evolution of Artificial Neural Networks, Neural Networks and Representation: Perceptron, Multilayer perceptron, weights and bias, Gradient Descent, basic concept of back propagation.	**07**
4	**Sense organs and prosthetic devices** Sense organs and their working, mechanism of sensing, artificial sense organs and their development, basics of artificial eye, artificial ear and prosthetic limb, introduction to cardiac pacemaker.	**07**
	Total	**26**

Text Books:	
1	Leslie Cromwell, Biomedical Instrumentation, Prentice Hall, 2011.
2	Thyagarajan S., Selvamurugan N., Rajesh M. P., Nazeer R. A., Thilagaraj W., Barathi S., and Jaganthan M. K., Biology for Engineers, Tata McGraw Hill, New Delhi, 2012.
Reference Books:	
1	John E Hall, Gyton's Medical Physiology, 12th edition, 2011.
2	Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", PHI/Pearson Education, 4th edition, 2001.
3	L. E. Baker L. A. Geddes, "Principles of Applied Biomedical Instrumentation", John Wiley and Sons, 3rd Edition, 1991.
4	R.S. Khandpur, Handbook of Biomedical Instrumentation, 2014 McGraw Hill Education (India) Private Limited
5	Anand Natarajan, Biomedical Instrumentation and Measurement, PHI Learning (14 December 2015)
6	G.S.Sawhney, Fundamentals of Biomedical Engineering,New Age International (P) Limited , Publication
Any other (Access to AI tools / Data driven insights (if applicable) or any other):	
1	https://jamesclear.com/wp-content/uploads/2016/08/ABriefGuidetoAcceleratedLearning.pdf
2	**You-tube video links:** By Dr. Siddharth Warrier, Neurologist i) The neuroscience of learning: https://www.youtube.com/watch?v=iVXV4KuBVKY ii) How to think better: https://www.youtube.com/watch?v=bGsA0agLlTY iii) 9 Insane Memory Hacks from a Neurologist: https://www.youtube.com/watch?v=7PNsoLKBKMM iv) How to achieve anything: https://www.youtube.com/watch?v=anjZDliSYww v) Neuroscience and Creativity: https://www.youtube.com/watch?v=GrIHnO6W8Ko

Internal Assessment:

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2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
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Continuous Assessment:

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Sr. No	Rubrics	Marks
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2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
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8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
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COURSE NAME: FUNDAMENTALS OF PROGRAMMING (C/JAVA)

Object Oriented Programming Methodology - Java Programming (AI & DS Branch)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES14	Object Oriented Programming Methodology - Java Programming (Theory)	03	---	---	03	---	---	03
NES14	Object Oriented Programming Methodology - Java Programming (Lab)	---	02	---	---	01	---	01

Object Oriented Programming Methodology - Java Programming (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES14	Object Oriented Programming Methodology - Java Programming (Theory)	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NES14	Object Oriented Programming	20	20	60	---	---	100

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	Methodology - Java Programming (Theory)						

Course Objectives:	
1	Understand the fundamental principles of Object-Oriented Programming and how they apply to Java development.
2	Develop proficiency in creating and manipulating classes, objects, and inheritance hierarchies in Java.
3	Learn the features of object orientation - encapsulation, abstraction, and polymorphism in Java programs.
4	Master the concepts of interfaces and abstract classes for creating flexible and modular Java applications.
5	Learn to implement interfaces and abstract classes for achieving contract-based programming and also exception handling to ensure robust and error-resistant Java programs.
Course Outcomes: At the end of the course learner will be able to	
1	Create and utilize classes, objects, and methods effectively to encapsulate data and behavior in Java programs.
2	Use inheritance and polymorphism concepts to facilitate code reuse and extensibility in Java applications.
3	Design and implement interfaces and abstract classes to achieve contract-based programming in Java.
4	Apply exception handling techniques to ensure robustness and fault tolerance in Java programs.
5	Utilize advanced OOP features like generics and design patterns to enhance code quality and maintainability in Java projects.

6	Explain and apply string matching techniques.

Object Oriented Programming Methodology - Java Programming(Lab)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
NES14	Object Oriented Programming Methodology - Java Programming (Lab)	---	02	---	---	01	---	01

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NES14	Object Oriented Programming Methodology - Java Programming (Lab)	---	---	---	25	–	25

Object Oriented Programming Methodology - Java Programming(Lab)

Prerequisite: Structured Programming Approach	
Lab Objective:	
1	To learn the basic concepts of object-oriented programming
2	To study JAVA programming language

3	To study various concepts of JAVA programming like multithreading, exception Handling, packages, etc.
4	To explain components of GUI based programming
Lab Outcome: At the end of the course, the students should be able to:	
1	Implement classes, objects, and methods effectively to encapsulate data and behavior in Java programs.
2	Efficiently use code reuse with inheritance and polymorphism concepts in Java Applications.
3	Handle Data Objects for CRUD operations and use arrays
4	Apply the idea of Exception Handling in program and to define user defined exceptions
5	Design ,Create,Interact using UI and to perform events from the UI
6	Perform multithreading

Object Oriented Programming Methodology - Java Programming (Theory)

Module		Detailed Content	Hours
1		**Introduction to Object Oriented Programming**	**4**
	1.1	OOP concepts: Objects, class, Encapsulation, Abstraction, Inheritance, Polymorphism, message passing.	
	1.2	Java Virtual Machine	
	1.3	Basic programming constructs: variables, data types, operators, unsigned right shift operator, expressions, branching and looping.	
2		**Class, Object, Packages and Input/output**	**10**
	2.1	Class, object, data members, member functions, Constructors, types, static members and functions, Packages in java, types, user defined packages, Input and output functions in Java	

	2.2	Array, Strings, String Buffer, Vectors	
3		**Inheritance and Interface**	**8**
	3.1	Types of inheritance, Method overriding, super, abstract class and abstract method, final, Multiple inheritance using interface, extends keyword	
4		**Exception handling and Multithreading**	**6**
	4.1	Exception handling using try, catch, finally, throw and throws, Multiple try and catch blocks, user defined exception	
	4.2	Thread lifecycle, thread class methods, creating threads using extends and implements keywords.	
5		**GUI programming in JAVA**	**8**
	5.1	AWT: working with windows, using AWT controls for GUI design	
	5.2	Swing class in JAVA, Introduction to JavaFX- Animation, Button, Canvas, Chart	
			36

Textbooks:	
1	Herbert Schildt, 'JAVA: The Complete Reference', Ninth Edition, Oracle Press.
2	E. Balagurusamy, 'Programming with Java', McGraw Hill Education.
References:	
1	Ivor Horton, "Beginning JAVA", Wiley India.
2	Dietal and Dietal, "Java: How to Program", 8th Edition, PHI .
3	"JAVA Programming", Black Book, Dreamtech Press.
4	"Learn to Master Java programming", Staredu solutions
Digital material:	
1	www.nptelvideos.in
2	www.w3schools.com
3	www.tutorialspoint.com
4	https://starcertification.org/Certifications/Certificate/securejava

Internal Assessment:

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1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report an certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

Object Oriented Programming Methodology - Java Programming(Lab)

Suggested Experiments: Students are required to complete at least 10 experiments.	
Star (*) marked experiments are compulsory.	
Sr. No.	**Name of the Experiment**
1	Implementing Classes and Objects for a scenario using object arrays.

2	Implementing Interactive Object Creation: Empowering Users to Generate Objects using Scanner Class
3	Implementing polymorphism using Method and Constructor for String Manipulation in Java
4	Implementing Inheritance and Interfaces for a scenario.
5	Implementation of Abstract Class and Abstract Method for a scenario.
6	Implementing JSON File Handling in Java to implement Create, Display, Update and Delete data objects.
7	Handling data with 2D arrays and ArrayList
8	Implement Exception Handling with User Defined Exception
9	Implementing Swing and AWT for creating UI
10	Implementing a class for performing Interaction of UI with JSON data Files.
11	Implementing Action Listeners for UI
12	Implementing Multithreading in Java for a File Processing

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructor to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that, the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Term Work:	
1	Term work should consist of 10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	Total 25 Marks (Experiments: 15-marks, Term work Assessment: 10-marks)

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COURSE NAME: FUNDAMENTALS OF PROGRAMMING (C/JAVA)

C-Programming

(EXTC,ETCS,AU & RO Branch)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES14	C-Programming (Theory)	03	---	---	03	---	---	03
NES14	C-Programming (Lab)	---	02	---	---	01	---	01

C-Programming(Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
NES14	C-Programming (Theory)	03	---	---	03	---	---	03
Course Code	Course Name	Examination Scheme						
		Theory			Term	Practical &		Total

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		Internal Assessment		End Sem Exam	Work	Oral	
		Mid-Term Test	Continuous Assessment				
NES14	C-Programming (Theory)	20	20	60	---	---	100

Course Objectives:	
1	To learn the fundamentals of computers and algorithms.
2	To understand various steps in program development and control structures.
3	To understand the concept of functions in C programming.
4	To understand usage of arrays and strings in C language.
5	To understand usage of Structures and Union in C language.
6	To understand the concept of pointers and dynamic memory allocation
Course Outcomes:	
1	To formulate simple algorithms for arithmetic and logical problems and translate them into programs in C language.
2	To implement conditional branching and iteration
3	To decompose problem into functions and synthesize complete program
4	To implement usage of arrays and strings in C language.
5	To implement usage of Structures and Union in C language.
6	To comprehend pointer concepts and dynamic memory allocation

C-Programming(Lab)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
NES14	C-Programming (Lab)	---	02	---	---	01	---	01

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Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NES14	C-Programming (Lab)	---	---	---	25	–	25

Lab Prerequisite: Basic understanding of Computer Programming terminologies.	
Lab Objectives:	
1.	To learn the fundamentals of computers and algorithms.
2.	To understand various steps in program development and control structures.
3.	To understand the concept of functions in C programming.
4.	To understand usage of arrays and strings in C language.
5.	To understand usage of Structures and Union in C language.
6.	To understand the concept of pointers and dynamic memory allocation
Lab Outcomes:	
LO1	To formulate simple algorithms for arithmetic and logical problems and translate them into programs in C language.
LO2	To implement conditional branching and iteration
LO3	To decompose problem into functions and synthesize complete program
LO4	To implement usage of arrays and strings in C language.
LO5	To implement usage of Structures and Union in C language.
LO6	To comprehend pointer concepts and dynamic memory allocation

C-Programming (Theory)

Module	Content	Hrs

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1	**Introduction, Fundamental of C Programming.** Introduction to components of a Computer System. Introduction to Algorithm and Flowchart ● Keywords, Identifiers Constants and Variables. ● Expression and In-built functions. ● Datatype and Operators in C. ● Expressions and Precedence of Operators. ● In- built Functions, Pre-processor Directives, library, Header Files.	**5**
2	**Control Structure, Branching and looping structures.** Introduction to Control Structures. ● If statement, If-else statement, Nested if-else, else-if Ladder. ● Switch statement ● For loop, while loop, do while loop ● Break, continue and go to statements	6
3	**Functions** ● Introduction to functions. ● Function prototype, Function definition, accessing a function and parameter passing: Call by Value and Call by reference. ● Recursive function.	4
4	**Array and Strings** ● Introduction to Arrays. ● Declaration and initialization of one. dimensional and two- dimensional arrays. ● Definition and initialization of String. ● String functions.	4
5	**Structure and Union** ● Concept of Structure and Union. ● Declaration and Initialization of structure and union. ● Nested structures. ● Array of Structures .	3

6	**Pointers** • Fundamentals of pointers • Declaration, initialization and dereferencing of pointers. • Concept of dynamic memory allocation.	4
	Total	**26**

Text Books:	
1	E. Balaguruswamy, Programming in ANSI C, McGraw-Hill
2	Kernighan , Ritchie, "The C programming Language", Prentice Hall of India
3	Sumitabha Das, Computer Fundamentals and C Programming, McGraw-Hill
4	Pradeep Day and ManasGosh ,"Programming in C", Oxford University Press.
Reference Books:	
1	Byron Gottfried, "Programming with C", McGraw Hill (Schaum"s outline series)
2	KanetkarYashwant," "Let Us C", BPB Publication.

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks

6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

C-Programming (Lab)

Suggested Experiments: Students are required to complete at least 10 experiments.	
Star (*) marked experiments are compulsory.	
Sr. No.	**Name of the Experiment**
1	Familiarization with programming environment
2	Simple computational problems using arithmetic expressions
3	Problems involving control structures & Looping
4	Demonstrate 1D,2D Array and Strings
5	Programs to demonstrate simple functions
6	Programs to demonstrate recursive functions
7	Problems involving structures
8	Programs to demonstrate the concept of pointers
9	Program to understand the concept of dynamic memory Allocation

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructor to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that, the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

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Term Work:	
1	Term work should consist of 10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	Total 25 Marks (Experiments: 15-marks, Term work Assessment: 10-marks)

COURSE NAME: PROGRAMME CORE COURSE (AI & DS)

Digital Logic & Computer Organization and Architecture

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NPC11	Digital Logic and computer Organization and Architecture (Theory)	02	---	---	02	---	---	02

Digital Logic & Computer Organization and Architecture (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NPC11	Digital Logic and computer Organization and Architecture (Theory)	02	---	---	02	---	---	02
Course Code	Course Name	Examination Scheme						
		Theory			Term Work	Practical & Oral	Total	

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		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NPC11	Digital Logic and computer Organization and Architecture (Theory)	20	20	60	---	---	100

Digital Logic & Computer Organization and Architecture (Theory)

Prerequisite: Knowledge on number systems	
Course Objectives:	
1	To have an understanding of the basic structure and operation of basic digital circuits and a digital computer.
2	To discuss in detail arithmetic operations in digital systems.
3	To discuss processor organization along with functions of control unit devices.
4	To study the memory hierarchy and principles of advanced computing.
Course Outcomes:	
1	To learn different number systems, arithmetic operations and the basics of digital logic.
2	To demonstrate combinational circuits.
3	To demonstrate sequential circuits.
4	To understand the basics of processor organization and architecture.
5	To understand the concept of a control unit.
6	To demonstrate the memory organization.

Digital Logic & Computer Organization and Architecture (Theory)

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Module	Content		Hours
1	**Basics of digital logic**		06
	1.1	Introduction to Binary, Decimal, Octal, and Hexadecimal number systems and conversion. Codes: Grey, BCD	
	1.2	Boolean algebra, basic gates and universal gates	
	1.3	Sum of products and products of sum, minimization with Karnaugh Map (up to four variables)	
	1.4	Binary Arithmetic: Addition, subtraction, multiplication, and division, sign magnitude, 1's and 2's complement method of data representation, subtraction using 1's and 2's complement method	
2	**Combinational Circuits**		03
	2.1	Half adder, Full adder, Arithmetic logic unit (ALU)	
	2.2	Multiplexer, Demultiplexer, Encoder and Decoder (design is not expected)	
3	**Sequential Circuits**		03
	3.1	Flip-Flops.: SR, JK, D, T (Block diagram and truth table)	
	3.2	Basics of counters and registers (only concept with a diagram, design is not expected)	
4	**Processor organization and architecture**		05
	4.1	Basic organization of computer and architecture, Von- Neumann model	
	4.2	Introduction to buses, types of buses- Address bus, data bus and control bus	
	4.3	Register organization, Instruction formats, addressing modes, instruction cycle	
5	**Control unit**		05
	5.1	Introduction to control unit, its functions with block diagram representation	
	5.2	Booth's multiplication algorithm, IEEE floating point representation	
6	**Memory organization**		06

	6.1	Introduction to memory and memory characteristics, types of RAM and ROM, memory hierarchy	
	6.2	Cache Memory: Concept, need of cache memory, locality of reference, cache mapping methods, design problems based on mapping techniques.	
		Total	**26**

Textbooks	
1	M. Morris Mano and Michael D. Ciletti, "Digital Design", Pearson Publications
2	R. P. Jain, "Modern Digital Electronic", McGraw-Hill Publication, 4thEdition.
3	William Stalling, "Computer Organization and Architecture: Designing and Performance", Pearson Publication 10TH Edition.
4	John P Hayes, "Computer Architecture and Organization", McGraw-Hill Publication, 3RD Edition.
5	Dr. M. Usha and T. S. Shrikanth, "Computer system Architecture and Organization", Wiley publication.
References	
1	Andrew S. Tanenbaum, "Structured Computer Organization", Pearson Publication.
2	B.Govindarajalu, "Computer Architecture and Organization", McGraw-Hill Publication.
3	Malvino, "Digital Computer Electronics", McGraw-Hill Publication, 3rdEdition.
Useful Links	
Resources	
1	https://www.classcentral.com/course/swayam-computer-organization-and-architecture-a-pedagogical-aspect-9824
2	https://nptel.ac.in/courses/106/103/106103068/
3	https://archive.nptel.ac.in/courses/108/105/108105132/
4	https://www.coursera.org/learn/comparch
AI Tools	
1	https://www.sifive.com/cores/intelligence
2	https://cloud.google.com/tpu?hl=en
3	https://shorturl.at/CTiPC

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Industry Articles	
1	https://shorturl.at/OllE9
2	https://rb.gy/m4mnki
Case Studies	
1	https://shorturl.at/M2X0I
2	https://t.ly/Av51F

Tutorial
A tutorial is to be conducted for a duration of an hour every week. It should contain a minimum of 7 tutorials based on the syllabus.
Internal Assessment
Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks. The Mid Term test is to be conducted when approximately 50% syllabus is completed and its duration will be one hour.
Continuous Assessment
Continuous Assessment is of 20 marks. The rubrics for assessment will be considered upon approval by the subject teachers. It should be a minimum of 2 or a maximum of 4 from the following table

Sr. No.	**Rubrics**	**Marks**
1	Multiple Choice Questions (Quiz)	5
2	Literature review of papers/journals	5

3	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	5
4	Wins in the event/competition/hackathon pertaining to the course	10
5	Case study, Presentation, group discussion, technical debate on recent trends in the said course	10
6	Project-based Learning and evaluation / Extra assignment / Question paper solution	10
7	NPTEL/ Coursera/ Udemy/any MOOC Certificate course for 4 weeks	10
8	Content beyond syllabus presentation	10
9	Creating Proof of Concept	10
10	Mini Project / Extra Experiments/ Virtual Lab	10
11	GATE Based on Assignment tests/Tutorials etc	10
12	Peer Review and participation	5/10
*For sr.no.7, the date of the certification exam should be within the term, and in case a student is unable to complete the certification, the grading has to be done accordingly.		
Indirect Assessment		
1	Mock Viva/Practical	
2	Skill Enhancement Lecture	
3	Extra Assignments/lab/lecture	
End Semester Theory Examination		

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1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

COURSE NAME: PROGRAMME CORE COURSE (EXTC)

Digital System

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NPC12	Digital System (Theory)	02	---	---	02	---	---	02

Digital System (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NPC12	Digital System (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous				

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			Assessment				
NPC12	**Digital System (Theory)**	**20**	**20**	**60**	**---**	**---**	**100**

Course Objectives:	
1	To understand number system representations and their inter-conversions used in digital electronic circuits.
2	To analyze digital logic processes and to implement logical operations using various combinational logic circuits.
3	To analyze, design and implement logical operations using various sequential logic circuits.
Course Outcomes:	
1	To understand types of number systems, digital logic, digital circuits and logic families.
2	To analyze, design and implement combinational logic circuits.
3	To analyze, design and implement sequential logic circuits.
4	To develop a digital logic and apply it to solve real life problems.

Module		**Content**	**Hrs**
1		**Number Systems and Codes**	**02**
	1.1	Review of Binary, Octal and Hexadecimal Number Systems, their inter-conversion, Binary code, Gray code and BCD code	
2		**Logic Family and Logic Gates**	**03**
	2.1	Digital logic gates, Universal gates, Realization using NAND and NOR gates, Boolean Algebra, De Morgan's Theorem	
3		**Combinational Logic Circuits**	**08**
	3.1	SOP and POS representation, K-Map up to four variables for minimization of logic expressions	
	3.2	Arithmetic Circuits: Half adder, Full adder, Half Subtractor, Full Subtractor, Carry Look ahead adder and BCD adder	

	3.3	Multiplexer and Demultiplexer: Multiplexer operations, Boolean function implementation using MUX, DEMUX and basic gates, Decoder	
4		**Sequential Logic Circuits**	**05**
	4.1	Flip flops: RS, JK, Master slave flip flops; T & D flip flops with various triggering methods, Conversion of flip flops	
	4.2	Counters: Asynchronous and Synchronous counters with State transition diagram	
		Total	**18**

Textbooks:	
1	John F. Warkerly, *"Digital Design Principles and Practices"*, Pearson Education, Fifth Edition (2018).
2	Morris Mano, Michael D. Ciletti, *"Digital Design"*, Pearson Education, Fifth Edition (2013).
3	R. P. Jain, *"Modern Digital Electronics''*, Tata McGraw Hill Education, Fourth Edition (2010).
4	A. Anand Kumar, *"Fundamentals of Digital Circuits"*, PHI, Fourth Edition (2016).
5	Volnei A. Pedroni, *"Digital Electronics and Design with VHDL",* Morgan Kaufmann Publisher, First Edition (2008).
6	Stephen Brown & Zvonko Vranesic, *"Fundamentals of Digital Logic with Verilog Design"*, Third Edition, MGH (2014).
Reference Books:	
1	Thomas L. Floyd, *"Digital Fundamentals"*, Pearson Prentice Hall, Eleventh Global Edition (2015).
2	Mandal, *"Digital Electronics Principles and Applications"*, McGraw Hill Education, First Edition (2010).
3	Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, *"Digital Systems Principles and Applications"*, Ninth Edition, PHI (2009).
4	Donald P. Leach, Albert Paul Malvino, Gautam Saha, *"Digital Principles and Applications"*, The McGraw Hill, Eight Edition (2015).
5	Stephen Brown & Zvonko Vranesic, *"Fundamentals of Digital Logic Design with VHDL"*, Second Edition, TMH (2009).

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1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

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COURSE NAME: PROGRAMME CORE COURSE (ETCS)

Digital Electronics

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NPC13	Digital Electronics (Theory)	02	---	---	02	---	---	02

Digital Electronics (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NPC13	Digital Electronics (Theory)	02	---	---	02	---	---	02
Course Code	Course Name	Examination Scheme						
		Theory			Term Work	Practical & Oral	Total	

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		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NPC13	Digital Electronics (Theory)	20	20	60	---	---	100

Course Objectives:	
1	To understand various number systems and their conversions.
2	To understand binary arithmetic operations
3	To understand basic logic gates and Boolean algebra for simplification of Boolean expressions.
4	To understand canonical form representation and k-map reduction technique.
5	To understand combinational logic circuits and their implementations using logic gates.
6	To understand the basics of latches, flip flops and shift registers.
Course Outcomes:After successful completion of the course students will be able to:	
1	Perform number system representation and their conversion
2	Perform binary arithmetic operations like addition and subtraction.
3	Implement basic gates using universal gates and simplify the Boolean expressions using Boolean algebra rules.
4	Perform logic reduction using reduction technique.
5	Implement and analyze combinational circuits using basic gates
6	Compare latches & flip flops and their implementation using logic gates

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Module	Unit	Contents	Hrs.
1	**Number System and Conversion**		
	1.1	Number Systems and code: Decimal, Binary, Octal, Hexadecimal and Gray code	**02**
	1.2	Conversion: Decimal to Binary, Octal & Hexadecimal and Binary to Decimal, Octal & Hexadecimal	
2	**Binary Arithmetic**		
	2.1	Binary Addition, Subtraction, 2's Complement representation and addition & subtraction using 2's Complement.	**02**
3	**Logic Gates and Boolean Algebra**		
	3.1	Introduction to logic gates and their implementation using universal gates.	**03**
	3.2	Boolean algebra, De Morgan's Theorem (examples on reducing the Boolean expression is expected)	
4	**Logic Minimization and Reduction Technique**		
	4.1	Canonical Form representation, K-map (Up to four variables), NAND, NOR Implementation	**04**
5	**Combinational circuits using Basic gates**		
	5.1	Half Adder, Full Adder, Multiplexer, Demultiplexer Encoder and Decoder.	**02**
6	**Introduction to Latches and flip flops**		
	6.1	Latch, Flip-Flop (SR, D, T, JK and Master-Slave), Introduction to Registers.	**02**
		Total	**15**

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Text Books:	
1	R. P. Jain, Modern Digital Electronics, Tata McGraw Hill Education, 5th Edition.
2	Thomas L Floyd, "Digital Fundamentals", Pearson Education, 11th Edition
Reference Books:	
1	Melvino & Leach, 'Digital Principles & Applications'', Tata McGraw Hill, 7th edition.
2	Morris Mano, Digital Design, Pearson Education, 5th Edition, Asia

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:

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1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

COURSE NAME: PROGRAMME CORE COURSE (AU & RO)

Electronic Measurement and Instrumentation

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NPC14	Electronics Measurement and Instrumentation (Theory)	02	---	---	02	---	---	02

Electronic Measurement and Instrumentation (Theory)

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Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NPC14	Electronics Measurement and Instrumentation (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NPC14	Electronics Measurement and Instrumentation (Theory)	20	20	60	---	---	100

Course Objectives:	
1	Foster an understanding of the fundamental principles of measurement.
2	Cultivate a comprehension of electronic indicating instruments.
3	To develop the understanding of DC and AC bridges and their applications.
4	To disseminate the fundamentals of Data acquisition.
Course Outcomes: Upon successful completion of this course, students will acquire the following abilities,	
1	Assess the quality of instruments based on static characteristics and perform statistical analysis of measurement errors.
2	Grasp the principles governing the functionality of electronic indicating instruments.

3	Recognize and formulate bridge circuits for both DC and AC measurements.
4	Gain insight into the fundamental operations of Data Acquisition Systems.

Module		Content	Hrs.
1		**MEASUREMENT AND ERROR**	**04**
	1.1	Definitions: Instrument, Accuracy, Precision, Sensitivity, Resolution, Significant Figures.	
	1.2	Types of Error: Gross errors, Systematic error and random error.	
	1.3	Statistical Analysis: Arithmetic Mean, Deviation from the Mean, Average Deviation and Standard Deviation.	
	1.4	Probability of Errors: Normal Distribution of Errors, Probable Error.	
	1.5	Limiting Errors.	
2		**INDICATING INSTRUMENTS**	**03**
	2.1	DC Ammeter and Voltmeters: Basic and multirange, Voltmeter Sensitivity, Ohms-per-volt Rating and Loading Effect, Voltmeter-Ammeter Method of Measuring Resistance. Ohmmeters: Series and Shunt-Type Ohmmeters. Calibration of DC Instruments, Multimeter.	
3		**BRIDGES AND THEIR APPLICATIONS**	**03**
	3.1	Introduction	
	3.2	DC Bridges: Wheatstone Bridge, Kelvin Bridge	
	3.3	AC Bridges and Their Application, Comparison Bridges, Maxwell Bridge, Schering Bridge, Unbalance condition, Wien Bridge	
4		**DATA ACQUISITION SYSTEM (DAS)**	**03**
	4.1	Introduction, Objective of a DAS, Signal Conditioning of the Inputs, Single Channel DAS, Multi-Channel DAS, Computer Based DAS.	
	4.2	Data Loggers, Sensors Based Computer Data Systems, Electromechanical A/D Converter, And Digital Transducers.	

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Total Hrs	**13**

Textbooks:	
1	*Modern Electronic Instrumentation and Measurement Techniques* by A. D. Helfrick and W. D. Cooper, PHI Learning Private Ltd.
2	*Electronic Instrumentation* by H. S. Kalsi, Third Ed., McGraw Hill
References:	
1	*Instrumentation: Devices and Systems* by C. S. Rangan, G. S. Sarma, and V.S.V. Mani, McGraw Hill Education.
2	*Measurement Systems: Application and Design* by Ernest O. Doebelin, McGraw Hill Education.

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
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6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks

9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

COURSE NAME : FUNDAMENTALS OF VEDIC MATHEMATICS

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
NIK11	Fundamentals of Vedic Mathematics (Theory)	02	---	---	02	---	---	02

Fundamentals of Vedic Mathematics (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)	Credits Assigned

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		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NIK11	Fundamentals of Vedic Mathematics (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NIK11	Fundamentals of Vedic Mathematics (Theory)	---	20	---	---	---	20

Course Objectives:	
1	Students will gain an understanding of the origins, history, and philosophy behind Vedic Mathematics, which is based on ancient Indian mathematical techniques found in the Vedas.
2	They will develop skills to perform arithmetic operations such as addition, subtraction quickly and efficiently.
3	They will learn various techniques to perform multiplication with any number of digits using vedic sutras and also learn to perform multiplication in algebra to solve equations
4	They will learn various techniques to find square and square roots of any number of digits using vedic sutras
5	They will learn various techniques to find cube a,fourth power ,cube roots and fourth root of any number of digits using vedic sutras
Course Outcomes:	
1	Students will develop the ability to perform mathematical calculations mentally and quickly using Vedic techniques.

2	Students will enhance their mental math skills and be able to perform arithmetic operations such as addition, subtraction, multiplication, and division mentally, without relying heavily on paper and pen.
3	They will learn to apply Vedic sutras and methods to solve a wide range of mathematical problems, including algebraic equations.
4	They will be able to break down complex problems into simpler steps and apply Vedic techniques to arrive at solutions more easily.
5	They will learn alternative approaches and multiple methods to solve mathematical problems, fostering creativity and adaptability in their problem-solving approach.

Module		Content	Hrs
1		**History and evolution of Vedic Mathematics**	**1**
	1.1	Historical facts about Vedic Mathematics	
	1.2	Sutras and sub sutras of Vedic Mathematics	
2		**Vedic sutras for addition and subtraction**	**4**
	2.1	Addition using dot method **(Vedic sutras:Ekadhikenpurvena)**	
	2.2	Addition without carrying **(Vedic sutras: Purnapurnabhyam,sankalan vyavkalanabhyam)**	
	2.3	Subtractions using all from 9 last from 10 **(Vedic sutras:Nikhilam Navatascaramam dasatah, Vinculum method)**	
	2.4	Subtraction using digit separator method (general Method)	
3		**Vedic sutras for multiplication**	**10**
	3.1	Multiplication by dot and stick method(General Method) **(Vedic sutras:Urdhva triyang [Vertically and crosswise])**	
	3.2	Multiplication when numbers are very close to base (all cases) **(Vedic sutras:Nikhilam Navatashcaramam dashatah)**	
	3.3	Multiplication based on **vedic sutra Antyayordashakepi and Antyayoshatakepi**	

	3.4	Multiplication when numbers are very far from the base (all cases) **(Vedic sutras:Anurupyena)**	
	3.5	Multiplication of three and four numbers	
	3.6	Multiplication by series of 9 and series of 1	
	3.7	Multiplication by observation	
	3.8	Multiplication of binomial equation	
	3.9	Multiplication of algebraic polynomials	
4		**Square and Square Root**	**6**
	4.1	Vedic Methods of finding squares:- 1. Ekadhikena Purvena 2. Yavadunam Tavduni kritya vargena Yojayet 3. Urdhva Tiryagbhyam 4. Duplex method	
	4.2	Vilokanam and Duplex Vedic Method of finding square root	
5		**Cube ,Cube root, Fourth Power of a number and Fourth root of a number**	**6**
	5.1	Vedic Methods of finding cubes:- Yavadunam,Anurupyena,Nikhilam	
	5.2	Vilokanam and Beejank for finding the cube root of any number	
	5.3	Pascal triangle, the method of finding the fourth power of a number	
	5.4	Vilokanam method for finding out the fourth root of number .	
		Total	**27**

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Text Books:	
1	Vedic MathematicsBy Jagadguru Sankracharya Bharti krishna Tirthaji Maharaj
2	The Essentials of vedic mathematics by Rajeshkumar thakur, Rupa Publication
Reference Books:	
1.	Advanced vedic mathematics by Rajeshkumar thakur, Rupa publication
2	Vedic Mathematics made easy by Dhaval bhatia, Jaico publishing house
3.	Vedic Mathematics:Sixteen simple Mathematical formulas from Vedas, Bharti krishna Tirthaji Maharaj, Motilal Banarsidass Publishers Pvt Ltd.

Continuous Assessment:
Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
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7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

COURSE NAME : UNIVERSAL HUMAN VALUES-1

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
NVE11	Universal Human Values-1 (Theory)	02	---	---	02	---	---	02

Universal Human Values 1 (Theory)

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Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NVE11	Universal Human Values-1 (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NVE11	Universal Human Values-1 (Theory)	---	20	---	---	---	20

Course Objectives:	
1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3	Strengthening of self-reflection.
4	Development of commitment and courage to act.
Course Outcomes:	
1	Understanding of natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking
2	Understanding the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation.

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Module		Content	Hrs
1		**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**	
	1.1	Purpose and motivation for the course, recapitulation from Universal Human Values-I	2
	1.2	Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' Continuous Happiness and Prosperity-Right understanding	2
	1.3	Continuous Happiness and Prosperity-Right understanding	2
	1.4	Relationship and Physical Facility	2
	1.5	Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario	2
	1.6	Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	2
2		**Understanding Harmony in the Human Being - Harmony in Myself!**	
	2.1	Understanding human being as a co-existence of the sentient 'I' and the material 'Body'	2
	2.2	Understanding the needs of Self ('I') and 'Body' - happiness and physical facility	2
	2.3	Understanding the Body as an instrument of 'I' ,Understanding the characteristics and activities of 'I' and harmony in 'I'	2
	2.4	Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail	2
		Total	**20**

Mode of Conduction
Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
practice sessions for analyzing and discussing the topic, help the students explore the important or critical elements.
Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

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Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

COURSE NAME: BASIC WORKSHOP PRACTICE

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total

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NVS11	Basic Workshop Practice (Lab)	---	04	---	---	02	---	02

Basic Workshop Practice (Lab)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
NVS11	Basic Workshop Practice (Lab)	---	04	---	---	02	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NES11	Basic Workshop Practice (Lab)	---	---	---	50	---	50

Sr No.	Topic	No. of Hrs.
Trade-1	**Fitting :** Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping. Term work to include one job involving following operations : filing to size, one simple male-female joint, drilling and tapping.	14
Trade-2	**Carpentry :** Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints. Term work to include one carpentry job involving a joint.	14
Trade-3	**Basic Electrical workshop:** **House Wiring** Electrical safety in the workplace. Protective equipment and tools. Different types of cables, electrical wiring diagrams, types of circuits, types of switches. Different wiring methods: Godown wiring, Staircase wiring, House wiring, Extension board. **PCB** Design, Layout drawing, Positive and negative film making, PCB etching and drilling,	10

	Tinning and soldering technique, component mounting and circuit testing.	
Trade-4	**Hardware and Networking :** Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard (Chipset), processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, Pen drives disk drives etc. Assembling a Personal Computer. Installation of Operating System (any one), Boot-up sequence and Device drivers. Installation of application software's, Basic Troubleshooting and Maintenance. Identification of network components LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables and rollover cables), Basic networking (LAN, WAN, configure IP address etc) and crimping.	**10**
	Total Engagement Hours	**48**

Assessment Tool	Rubrics with Marks	Total Marks
Term Work	**Mechanical Workshop:-** **Fitting :** Job Submission - 10 Marks **Carpentry :** Job Submission - 10 Marks Job Sheet for Fitting and Carpentry - 05 Marks **Basic Electrical workshop:** **House Wiring :** Demonstration with Job sheet : 05 Marks **PCB :** Project with Journal : 05 Marks **Hardware and Networking :** Oral along with journal submission - 10 Marks **Attendance : 05 Marks**	**50 Marks**

COURSE NAME : CO CURRICULAR COURSE

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total

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NCC11	Co curricular course	02	---	---	02	---	---	02

Co Curricular Course

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NCC11	Co curricular Course	---	04	---	---	02	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NCC11	Co curricular Course	---	---	---	---	25	25

In the first year curriculum, students are allocated 25 marks in each semester for engaging in social work . This initiative involves a range of activities such as cleaning college premises, participating in Kalash Yatra, tree plantation drives, beach cleaning campaigns, organizing cultural programs, attending yoga courses, environmental awareness programs, and more. These activities aim to instill a sense of social responsibility and civic engagement among students, fostering a well-rounded educational experience that goes beyond the classroom.

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Semester II

Syllabus

Group B

Artificial Intelligence and Data Science

Electronics and Telecommunications

Electronics and Computer Science

Automation and Robotics

COURSE NAME : FUNDAMENTALS OF ENGINEERING MATHEMATICS-2

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total

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NBS21	**Fundamentals of Engineering Mathematics-2 (Theory)**	**02**	**---**	**01***	**02**	**---**	**01**	**03**

Fundamentals of Engineering Mathematics-2(Theory)

Course Code	**Course Name**	**Teaching Scheme (Teaching Hours)**			**Credits Assigned**			
		Theory	**Practical**	**Tutorial**	**Theory**	**TW/PR**	**Tut**	**Total**
NBS21	**Fundamentals of Engineering Mathematics-2 (Theory)**	**02**	**---**	**01***	**02**	**---**	**01**	**03**

Course Code	**Course Name**	**Examination Scheme**					
		Theory			**Term Work**	**Practical & Oral**	**Total**
		Internal Assessment		**End Sem Exam**			
		Mid-Term Test	**Continuous Assessment**				
NBS21	**Fundamentals of Engineering Mathematics-2 (Theory)**	**20**	**20**	**60**	**---**	**---**	**100**

Tutorials to be conducted batchwise

Course Prerequisite: Coordinate Geometry (H.Sc. Level)
Course Objectives:

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1	To learn about solution methods of higher order linear differential equations
2	To explore concepts of beta and Gamma functions
3	To provide students with complete understanding about the concept of double integration.
4	To learn about applications of multiple integration
5	To apply the concept of inverse of a matrix for coding and decoding of a message.
Course Outcomes:	
1	**Differential Equations**– Students would develop the ability to analyze and solve higher order linear differential equations, model real-world phenomena, apply mathematical techniques to solve differential equations, and interpret the solutions in the context of the problem**.**
2	**Improper Integrals**– Students should develop the ability to manipulate and simplify expressions involving the beta and gamma functions, utilizing properties and identities, and recognizing connections to other mathematical functions.
3	**Double Integral**–Students should be able to apply double integration to solve problems in various fields, such as physics, engineering, economics, and probability.
4	**Applications of Double Integrals**–Students should understand the geometric interpretation of double integrals,the approach for finding areas, volumes, centers of mass, moments of inertia, and computing average values and expected values in probability and statistics.
5	**Coding and Decoding:**Students should understand the application of inverse of a matrix to code and decode the message

Module		**Content**	**Hrs**
1		**Higher order Linear Differential Equations with constant coefficient**	**08**
	1.1	Complementary function and particular integrals of differential equations of the type f(D)y = 0 (Homogeneous case)	
	1.2	Complementary function and particular integrals of differential equations of the type f(D)y = X (Nonhomogeneous case) where X is e^{ax}, sin (ax+b), cos (ax+b), x^n, $e^{ax}V$, xV.	
	1.3	Method of variation of parameters	
2		**Beta and Gamma function**	**05**
	2.1	Beta and Gamma functions and its properties,Examples	

3		**Double Integrals**	**10**
	3.1	Double and Iterated Integrals over Rectangles Double Integrals over General Regions	
	3.2	Double Integral by change of order	
	3.3	Double Integrals in Polar Form,Double integration by change of coordinates(Cartesian to polar)	
4		**Application of Double Integration:**	**02**
	4.1	Area and Mass by Double Integration	
5		**Coding and Decoding**	**03**
	5.1	Methods of Encoding and decoding	
	5.2	Hill Cipher coding and decoding using modulo function	
	5.3	Examples of coding and decoding.	
		Total	**28**

Textbooks:	
1	R.K.Jain and S.R.K.Iyengar "Advanced Engineering Mathematics",Alpha science International Ltd.
2	Advanced Engineering Mathematics, H.K Dass,S. Chand Publications
Reference Books:	
1	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, Inc
2	B.S. Grewal, " Higher Engineering Mathematics",Khanna Publication
3	George B. Thomas, Weir & Hass, "Thomas' Calculus",Pearson
4	George F. Simmons, "Differential Equations with Application", Tata Mc. Graw Hill Edition
5	Howard Anton, Chris Rorres,"Elementary Linear Algebra",wiley Publication

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.

2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of 20 marks. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

COURSE NAME: ENGINEERING PHYSICS

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Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NBS12	Engineering Physics (Theory)	02	---	---	02	---	---	02
NBS12	Engineering Physics (Lab)	---	02	---	---	01	---	01

Engineering Physics (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NBS22	Engineering Physics (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NBS22	Engineering Physics (Theory)	20	20	60	---	---	100

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Pre- requisites for the course: HSc. level Physics	
Course Objectives:	
1	To provide inclusive knowledge and skill, necessary for solving problems in the engineering field
2	To provide inclusive knowledge and skill, necessary for venturing in the research field.
Course Outcomes:	
1	Learners will be able to understand the foundation of quantum mechanics and how to solve problems in different areas of modern technology
2	Learners will be able to understand the basics and different applications of differently conducting materials like semiconductors and supercapacitors
3	Learners will be able to understand the foundation of fiber optics and their applications in the areas of communication, medical science and instrumentation
4	Learners will be able to interpret and explore basic sensing techniques for physical measurements in modern instrumentations

Engineering Physics (Lab)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
NBS22	Engineering Physics (Lab)	---	02	---	---	01	---	01

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NBS22	Engineering Physics (Lab)	---	---	---	25	–	25

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Lab Objectives:	
1	To get practical knowledge of the theory learnt and develop experimental skills.
2	To comprehend the importance of precision, accuracy, errors and analyze experimental results.
Lab Outcomes: After successful completion of the course students will be able to:	
1	Learners will be able to understand the dependance of photo current on frequency and intensity of light
2	Learners will be able to understand the efficiency of Supercapacitor in terms of charging and discharging time.
3	Learners will be able to understand the directionality of He-Ne LASER
4	Learners will be able to understand the functioning of photo diode and Hall effect set up as sensor for light and magnetic field respectively.

Engineering Physics (Theory)

Module	Content	Hrs
1	**QUANTUM MECHANICS:** Inadequacy of classical theory; de Broglie hypothesis of matter waves and its experimental verification; Wave packet, group velocity and phase velocity; Heisenberg Uncertainty principle, Thought experiments and applications of HUP, Wave function and its physical interpretation; Schrodinger's time dependent and time independent wave equation; Free particle: finite potential well (qualitatively)	8
2	**DIFFERENTLY CONDUCTING MATERIALS:** **Semiconductors**: Band theory, Direct and Indirect band gap semiconductor; FD distribution function; Fermi energy level in conductors and semiconductor; Intrinsic semiconductors: energy band diagram, Expression for Fermi level; Effective mass; Intrinsic carrier concentration, mobility & conductivity, Extrinsic semiconductors: Fermi energy level, Expression & position; Effect of impurity concentration & temperature on the Fermi level and carrier concentration; Law of mass action, minority charge carrier concentration. Formation of depletion region & potential barrier in a p-n junction, Drift & Diffusion of charge carriers across p-n junction, Drift & Diffusion current density, Energy band diagram & current	9

	densities in unbiased, forward & reverse biased p-n junction. **Supercapacitors:** Principle, construction, materials and applications, Comparison with capacitor and batteries : Energy density, Power density.	
3	**FIBRE OPTICS:** **FIBRE OPTICS:** Working principle, structure & material, advantage; Critical angle; Acceptance angle; Numerical aperture; fractional change in R.I., Modes of propagation, Single & Multimode fiber, R.I. profile – Step & Graded Index fiber; V Number, Allowed modes, Applications – Fiber optic communication system	**4**
4	**PHYSICS OF SENSOR:** Optical sensors: Photodiode, Photoresistor, Solar cell; (construction and uses) Magnetic sensor**:** Principle of Hall effect, Application Mechanical sensors: Concept of piezoelectricity, Applications	**3**
	Total	**24**

Reference Books:	
R1	A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand
R2	Engineering Physics- D. K. Bhattacharya and Poonam Tandon, Oxford Publications
R3	Engineering Physics- H. K. Malik, A. Singh, McGraw Hill
R4	Concepts of Modern Physics- ArtherBeiser, Tata McGraw Hill
R5	Introduction to Solid State Physics- C. Kittle, John Wiley& Sons
R6	Semiconductor Physics and Devices: S. M. Sze, Wiley
R7	Ultracapacitors: The future of energy storage- R.P Deshpande, McGraw Hill
R8	Handbook of Modern Sensors Physics design and application-Jacob Fraden, Springer, AIP press

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

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Continuous Assessment:
Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five needs to be solved.

Engineering Physics (Lab)

Suggested Experiments: Students are required to complete at least 10 experiments.	
Star (*) marked experiments are compulsory.	
Sr. No.	**Name of the Experiment**
1	Determination of 'h' using Photo cell.
2	Determination of energy band gap of semiconductor

3	Study of Hall Effect
4	Study of PT100 calibration and use as thermometer.
5	Determination of Numerical Aperture of an optical fiber.
6	Study of I-V characteristics of Photo diode.
7	Charging and discharging characteristics of supercapacitor.
8	Study of divergence of laser beam
9	Determination of number of lines on the grating surface using LASER Source.
10	Determination of radius of curvature of a lens using Newton's ring set up
11	Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
12	Determination of wavelength using Diffraction grating. (Hg/Na source)

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructor to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that, the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Term Work:	
1	Term work should consist of 10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	Total 25 Marks (Experiments: 15-marks, Term work Assessment: 10-marks)

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COURSE NAME: ENGINEERING MECHANICS

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES21	Engineering Mechanics (Theory)	02	---	---	02	---	---	02

Engineering Mechanics (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES21	Engineering Mechanics (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NES21	Engineering Mechanics (Theory)	20	20	60	---	---	100

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Course Objectives:	
1	To create a strong foundation in basic principles of statics and to apply the knowledge to analyze and solve engineering problems involving different systems of forces, static equilibrium etc.
2	To understand the principles and methods used to analyze the motion and behavior of particles and rigid bodies without the influence of forces.
Course Outcomes:	
1	Understand and analyze the behavior of multiple forces acting in a single plane.
2	Understand the conditions for a body to be in a state of equilibrium and to analyze and solve problems related to the equilibrium.
3	Understand and predict motion, analyze velocity and acceleration, characterize different types of motion without consideration of mass of the body.
4	Do kinematic analysis of linkages and mechanisms by locating instantaneous center of rotation.

Engineering Mechanics (Theory)

Module	Content	Hrs
1	**System of Coplanar Forces:** Classification of force systems, Principle of transmissibility, composition and resolution of forces. Resultant of coplanar force system (Concurrent forces, parallel forces and non-concurrent Non-parallel system of forces). Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plane.	**06**
2	**Equilibrium of System of Coplanar Forces:** Equilibrium concept, Conditions of equilibrium for concurrent forces, parallel forces and non-concurrent non- parallel general forces and Couples. Free body diagrams. Equilibrium of rigid bodies. Types of beams, simple and compound beams, type of supports and reaction. Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges)	**08**
3	**Kinematics of Particle:**	**06**

	Motion of particles with variable acceleration. Motion curves. Application of concepts of projectile motion and related numerical. Motion under gravity.	
4	**Kinematics of Rigid Body (Instantaneous center of rotation):** Translation, Rotation and General Plane motion of Rigid body. The concept of Instantaneous center of rotation (ICR) for the velocity. Location of ICR for up to 3 links mechanisms. Velocity analysis of rigid bodies using ICR.	**04**
	Total	**24**

Text Books:	
1	Engineering Mechanics by M.D. Dayal
Reference Books:	
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 by A K Tayal, UmeshPublication.
7	Engineering Mechanics by Kumar, Tata McGrawHill
8	Engineering Mechanics (Statics) by Meriam and Kraige, WileyBools
9	Engineering Mechanics (Dynamics) by Meriam and Kraige, WileyBools

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

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Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

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COURSE NAME: ENGINEERING DRAWING

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES22	Engineering Drawing (Lab)	---	02 (DH)+ 02(AutoCAD)	---	---	02	---	02

Engineering Drawing (Lab)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES22	Engineering Drawing (Lab)	---	02 (DH)+ 02(AutoCAD)	---	---	02	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NES22	Engineering Drawing (Lab)	---	---	---	25	25	50

Note: 2 Hrs Drawing Hall & 2 Hrs AutoCAD Practical

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Lab Objectives:	
1	To impart and inculcate proper understanding of the theory of projection, the knowledge of reading a drawing and to improve the visualization skill.
Lab Outcomes	
1	Apply the basic principles of projections in converting 3-D view to 2-D drawing with and without section.
2	Read a given drawing and visualize a 3-D object from the given two or three views.

Sr No.	Topic	No. of Hrs.
1	**Orthographic Projections:** Fundamentals of orthographic projections. Different views of a simple machine part as per the first angle projection method recommended by I.S.	08
2	**Sectional Orthographic Projections:** Basic concept and significance of sectional orthographic projections. Full sectional view of simple machine parts (Excluding half section).	08
3	**Isometric Views:** Isometric Views, Conversion of Orthographic Views to Isometric Views (Excluding Sphere and circle on an inclined plane).	08
	Total Hours	24

AutoCAD (Lab)

Lab Objectives:	
1	To inculcate the skill of drawing with the basic concepts.
2	To Use AutoCAD for daily working processes.
3	To teach basic utility of Computer Aided drafting (CAD) tool
Lab Outcomes: Students will be able to...	
1	Apply the basic principles of projections in 2D drawings using CAD software.

2	Create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features.
3	Apply basic AutoCAD skills to draw different views of a 3D object.
4	Apply basic AutoCAD skills to draw the isometric view from the given two views.

Sr No.	Topic	No. of Hrs.
1	**Overview of Computer Graphics Covering:** Listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.	**08**
2	**Customization & CAD Drawing:** Consisting of set up of the drawing page and the printer including scale settings, Setting up of units and drawing limits, ISO and ANSI standards for coordinate dimensioning.	**08**
3	**Annotations and other Functions Covering:** Applying dimensions to objects, applying annotations to drawings, Changing line lengths through modifying existing lines (extend/lengthen), Printing documents to paper using the print command, orthographic projection techniques, Drawing sectional views of objects (simple machine parts), Drawing isometric views by using Isometric drafting.	**08**
	Total Practical Hours	**24**

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Text Books:	
1	N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd.
2	N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd.
Reference Books:	
1	Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publisher.
2	Prof. Sham Tickoo (Purdue University) Gaurav Verma, "(CAD Soft Technologies) :Auto CAD 2012 (For engineers and Designers)", Dreamtech Press NewDelhi.
3	Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill.

Examination Scheme :

Assessment Tool	Way to Conduct	Marks
Term Work	1. Engineering Drawing A3 size Assignment Sheets -**10 Marks** 2. AutoCAD assignments to be printed on A4 size sheets - **10 Marks** 3. Attendance -**5 Marks**	**25 Marks**
Practical Examination	1. Solve 2 compulsory questions. 2.Question on Orthographic Projection / Sectional Orthographic Projection - 15 Marks 3. Question on Isometric Projection- 10 Marks 4. Should be conducted for 2 Hours.	**25 Marks**

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COURSE NAME: BASIC ELECTRICAL ENGINEERING

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES23	Basic Electrical Engineering (Theory)	03	---	---	03	---	---	03
NES23	Basic Electrical Engineering (Lab)	---	02	---	---	01	---	01

Basic Electrical Engineering (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES23	Basic Electrical Engineering (Theory)	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NES23	Basic Electrical Engineering (Theory)	20	20	60	---	---	100

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Prerequisite: Resistance, inductance, capacitance, series and parallel connections of resistance, concepts of voltage, current, power and energy and its units. Working of wattmeter, Magnetic circuits, MMF, Magnetic field strength, reluctance, series and parallel magnetic circuits, BH Curve, Time domain analysis of first order RL and RC circuits	
Course Objectives:	
1	To provide knowledge on fundamentals of DC circuits and single phase and three phase AC circuits and its applications.
2	To inculcate knowledge on the basic operation and performance of 1-Φ transformers.
3	To provide knowledge on fundamentals of DC and AC machines.
Course Outcomes:	
1	Apply various network theorems to determine the circuit response / behavior.
2	Evaluate and analyze 1-Φ circuits.
3	Evaluate and analyze 3-Φ AC circuits.
4	Understand the constructional features and operation of 1-Φ transformer
5	Illustrate the working principle of a DC machine.
6	Illustrate the working principle of AC machines.

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Basic Electrical Engineering (Lab)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NES23	Basic Electrical Engineering (Lab)	---	02	---	---	01	---	01

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NES23	Basic Electrical Engineering (Lab)	---	---	---	25	–	25

Lab Objectives:	
1	To impart the basic concept of network analysis and its application.
2	To provide the basic concept of ac circuits analysis and its application.
3	To illustrate the operation of machines and transformer.
Lab Outcomes	
1	Interpret and analyze the behavior of DC circuits using network theorems.
2	Perform and infer experiment on single phase AC circuits.
3	Demonstrate experiment on three phase AC circuits.
4	Illustrate the performance of single-phase transformer and machines.

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Basic Electrical Engineering (Theory)

Module		Content	Hrs
1		**DC Circuits**	**12**
	1.1	(Only independent source) Ideal and practical Voltage and current Sources, Source Transformation, Kirchhoff's Laws,	
	1.2	Star-Delta / Delta-Star Transformation, Mesh and Nodal Analysis.	
	1.3	Superposition, Thevenin's Theorem	
	1.4	Norton's Theorem and Maximum Power Transfer Theorem.	
2		**AC Circuits**	**12**
	2.1	Generation of alternating voltage, basic definitions, average and rms values, phasor and phase difference, sums on phasors.	
	2.2	Single-phase ac series and parallel circuits consisting of R, L, C, RL, RC, RLC combinations, Definitions - real, reactive and apparent power, admittance (Y), Series and parallel resonance, Q factor.	
3		**Three Phase Circuits**	**5**
	3.1	Generation of Three-Phase Voltages, voltage & current relationships in Star and Delta Connections,	
	3.2	Power measurement in three phase balanced circuit(Only two wattmeter method).	
4		**Transformers**	**5**
	4.1	Working principle of single-phase transformer, EMF equation of a transformer, Transformer losses	
	4.2	Actual (practical) and ideal transformer, Phasor diagram (considering winding resistance and magnetic leakage) Equivalent circuit. Open-circuit test (no-load test), short circuit (SC) test, efficiency.	
5		**DC Machines**	**3**
	5.1	Principle of operation of DC generators and DC motors, constructional details, and classification of DC machines, e.m.f. equation of generator/motor, applications.	

6		**AC Machines**	**2**
	6.1	Rotating magnetic field produced by three phase ac, principle of operation of Three-phase induction motor, constructional details, and classification of Induction machines.	
Self-study Topic		Introduction to type of Batteries, Lithium-ion and Lead Acid Batteries, Charging and Discharging, Application.	
		Total	**39**

Text Books:	
1	V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Revised Edition)
2	Vincent Del Toro "Electrical Engineering Fundamentals", PHI Second edition, 2011
3	Edward Hughes "Hughes Electrical and Electronic Technology", Pearson Education (Tenth edition)
4	D P Kothari and I J Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.
5	M. Naidu, S. Kamakshaiah "Introduction to Electrical Engineering" McGraw-Hill Education, 2004
6	B.R Patil "Basic Electrical Engineering" Oxford Higher Education
Reference Books:	
1	B. L. Theraja "Electrical Engineering " Vol-I and II.
2	S. N. Singh, "Basic Electrical Engineering" PHI , 2011Book

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
2) Mid Term test is to be conducted when approx. 50% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

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Department of Humanities & Applied Sciences

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation the marks can be left blank (with discretion of faculty)	05 Marks

End Semester Theory Examination:	
1	Question paper will be of 60 marks
2	Question paper will have a total of five questions
3	All questions have equal weightage and carry 20 marks each
4	Any three questions out of five need to be solved.

Basic Electrical Engineering (Lab)

Suggested Experiments: Students are required to complete at least 10 experiments.	
Star (*) marked experiments are compulsory.	
Sr. No.	**Name of the Experiment**
1	Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors, and inductors.
2	To measure output voltage across load resistor/current through load resistor and verify the result using Mesh and Nodal analysis.
3	Verification of Superposition Theorem.

4	Verification Thevenin's Theorem/ Norton's Theorem.
5	Verification Maximum Power Transfer Theorem.
6	To find resonance conditions in a R-L-C series resonance circuit
7	To find resonance conditions in a R-L-C parallel resonance circuit.
8	To measure relationship between phase and line, currents and voltages in three phase system (star & delta)
9	To measure Power and phase in three phase system by two wattmeter method.
10	To find the equivalent circuit parameters by conducting OC and SC test on single phase transformer.
11	To demonstrate cut-out sections of DC machine.
12	To study AC machine.

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructor to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that, the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Term Work:	
1	Term work should consist of 10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	Total 25 Marks (Experiments: 15-marks, Term work Assessment: 10-marks)

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COURSE NAME : PROFESSIONAL COMMUNICATIONS AND ETHICS-1

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
NAE21	Professional Communications and Ethics-1 (Theory)	01	---	02	01	---	01	02

Professional Communications Ethics-1 (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NAE21	Professional Communications and Ethics-1 (Theory)	01	---	02	01	---	01	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NAE21	Professional Communications and Ethics-1 (Theory)	20	80	---	---	---	100

(Two hrs tutorial is divided into batches of 20 - 30 students)

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Course Objectives:	
1	To demonstrate the fundamental concepts of interpersonal and professional communication.
2	To encourage active listening with focus on content, purpose, ideas and tone.
3	To facilitate fluent speaking skills in social, academic and professional situations
4	To train in reading strategies for comprehending academic and business correspondence.
5	To promote effective writing skills in business, technology and academic arenas.
6	To inculcate confident personality traits along with grooming and social etiquettes.
Course Outcomes:	
1	Eliminate barriers and use verbal/non-verbal cues at social and workplace situations.
2	Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone and pronunciation.
3	Prepare effectively for speaking at social, academic and business situations.
4	Use reading strategies for faster comprehension, summarization and evaluation of texts.
5	Acquire effective writing skills for drafting academic, business and technical documents.
6	Successfully interact in all kinds of settings, displaying refined grooming and social skills.

Sr No.	**Topic**	**No. of Hrs.**
M1	Fundamentals of Communication: - 1.1. Introduction to Theory of Communication ● Definition ● Objectives ● The Process of Communication ● Organizational Communication 1.2. Methods of Communication	**4 Hrs**

	1.3. Barriers to Communication 1.4 Developing Reading and Writing Skills	
M2	2.1. Vocabulary Building ● Meaning of Words in Context ● Synonyms & Antonyms ● Collocations ● Prefixes & Suffixes 2.2. Grammar ● Identifying Common Errors ○ Subject - Verb Agreement ○ Misplaced Modifiers ○ Articles ○ Prepositions ● Tautologies ● Pleonasms (Redundancies) ● Idioms	**2 Hrs**
M3	BUSINESS CORRESPONDENCE 4.1. Seven Cs of Business Correspondence ● Completeness ● Conciseness ● Consideration ● Concreteness ● Clarity ● Courtesy ● Correctness 4.2. Parts of a Formal Letter and Formats ● Parts/Elements of a Formal Letter ○ Letterheads and/or Sender's Address ○ Dateline ○ Inside Address ○ Reference Line (Optional) ○ Attention Line (Optional) ○ Salutation ○ Subject Line ○ Body ○ Complimentary Close ○ Signature Block ○ Enclosures/Attachments ● Complete/Full Block Format	**3 Hrs**

	4.3. Emails ● Format of Emails ● Features of Effective Emails ● Language and style of Emails 4.4. Types of Letters in Both Formal Letter Format and Emails ● Claim and Adjustment Letters ● Request/Permission Letters ● Sales Letters	
M 4	Personality Development and Social Etiquettes 6.1. Personality Development ● Introducing Self and/or a Classmate ● Formal Dress Code 6.2. Social Étiquettes ● Formal Dining Étiquettes ● Cubicle Étiquettes ● Responsibility in Using Social Media ● Showing Empathy and Respect ● Learning Accountability and Accepting Criticism ● Demonstrating Flexibility and Cooperation ● Selecting Effective Communication Channels	**3 Hrs**
M5	**Book Review** ● Review of a book.: Students have to read and analyze the book given and should be able to write a two page review on it. ● Book review presentation	**2 Hrs**
	Total Engagement Hours	**14**

List of Tutorials:

S.No	Details of Assignment	Details of Activity	Hours	Marks
1	Transcription of the public speech along with a plagiarism report	Practice public speech	2	5
2	Transcription of the public speech along with a plagiarism report	Public speech	2	10
3	Case Studies on types of communication, Barriers to effective Communication and its consequences.	Role Play / Case Studies	4	10

4	Written record of reading activities	Advanced level reading comprehension with MCQs	4	5
5	Aptitude test	Aptitude test on vocabulary and grammar for Engineers	4	10
6	2 types of letters in complete block format/Email	Request/ Permission; Adjustment / claim; Sales letters	4	10
7	Understanding of Social Etiquettes	Group Activities related to various etiquettes based on Module 4	4	10
8	Presentation on Book Review	Exploration and Analysis of perception related to global environment presented in the Book	4	10 (to be added to Book Review)
Book Review: 20 Marks (List of books will be selected by the respective teachers)				

Textbooks:	
1	Sanjay Kumar & Pushp Lata (2018). Communication Skills with CD. New Delhi:Oxford University Press.
2	Hemphill, P.D., McCormick, D. W., & Hemphill, R. D. (2001). Business Communication with writing improvement exercises. Upper Saddle River, NJ:Prentice Hall.
3	Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). Business Communication: Building Critical Skills. Place of publication not identified: Mcgraw-hill.
4	Murphy, H. (1999). Effective Business Communication. Place of publication not identified: Mcgraw-Hill.
5	Raman, M., & amp; Sharma, S. (2016). Technical Communication: Principles and practice. New Delhi: Oxford University Press.University of Mumbai, First Year Engineering, (Common for all Branches of Engineering) REV2019 'C' Scheme 51/61
6	Kaul, A. (2015). Effective Business Communication. Place of publication not identified: Prentice-Hall of India.
7	Rizvi, A. M. (2010). Effective Technical Communication: A guide for Scientists and

	Engineers. New Delhi: Tata McGraw Hill.
8	Lewis, N. (2014). Word power made it easy. Random House USA.

Internal Assessment:

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3) Duration of the midterm test shall be one hour.

Continuous Assessment:

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4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
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7	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
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COURSE NAME : UNIVERSAL HUMAN VALUES-2

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
NVE22	Universal Human Values-2 (Theory)	02	---	---	02	---	---	02

Universal Human Values 2 (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NVE22	Universal Human Values-2 (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NVE22	Universal Human Values-2 (Theory)	---	20	---	---	---	20

Course Objectives:	
1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3	Strengthening of self-reflection.

4	Development of commitment and courage to act.
Course Outcomes:	
1	Broad Reflection on relationships in family, hostel and institute as extended family,
2	Understanding of human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
3	Understanding of the conduct as an engineer or scientist etc.

Module		Content	Hrs
1		**Understanding Harmony in the Family - Harmony in Human-Human Relationship**	
	1.1	Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and its fulfillment to ensure mutual happiness	2
	1.2	Understanding the meaning of Trust; Difference between intention and competence	2
	1.3	Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship	2
2		**Understanding Harmony inSociety**	
	2.1	Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals	2
	2.2	Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family	2
3		**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**	
	3.1	Understanding the harmony in the Nature	2
	3.2	Understanding Existence as Coexistence of mutually interacting units in all-pervasive space	2
	3.3	Holistic perception of harmony at all levels of existence.	2
4		**Implications of the above Holistic Understanding of Harmony on**	

		Professional Ethics	
	4.1	Natural acceptance of human values	2
	4.2	Definitiveness of Ethical Human Conduct	2
	4.3	Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order	2
	4.4	Competence in professional ethics	2
5		**Introduction : The Constitution of India and Fundamental Rights (NPTEL Video Lecture)**	
	5.1	Introduction to Constitution and Constitutional Law • Constitution, Constitutionalism and Constitutional Law • Difference between Constitutional law and other laws • Types of Constitution • Salient Features of the Constitution of India • Preamble to the Constitution of India: Its Role, Vision, Interpretation and Amendment	2
	5.2	Fundamental Rights and Directive Principles of State Policy • Concept of Fundamental Rights vis a vis Directive Principles of State Policy • Definition of State and Instrumentalities of State • Enumerated Fundamental Rights • Enforceability of Fundamental Rights vis -a -vis Directive Principles of State Policy • Primacy of Fundamental Rights and Directive Principles of State Policy • Constitutional Remedies to derogation of Fundamental Rights	2
		Total	**28**

Mode of Conduction

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

practice sessions for analyzing and discussing the topic, help the students explore the important or critical elements.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

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8.	Multiple Choice Questions (Quiz)	05 marks
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COURSE NAME : CO CURRICULAR COURSE

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
NCC22	Co curricular Course	02	---	---	02	---	---	02

Co Curricular Course

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
NCC22	Co curricular Course	---	04	---	---	02	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
NCC22	Co curricular Course	---	---	---	---	25	25

In the first year curriculum, students are allocated 25 marks in each semester for engaging in social work . This initiative involves a range of activities such as cleaning college premises, participating in Kalash Yatra, tree plantation drives, beach cleaning campaigns, organizing cultural programs, attending yoga courses, environmental awareness programs, and more. These activities aim to instill a sense of social responsibility and civic engagement among students, fostering a well-rounded educational experience that goes beyond the classroom.