



VIVEKANAND EDUCATION SOCIETY'S Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

Department of Electronics and Telecommunication Engineering

Department of Electronics and Telecommunication Engineering

**Second Year (Sem III & Sem IV) Syllabus
(2026 'NEP&Autonomy' Scheme)**

Batch [2025-2029]



VIVEKANAND EDUCATION SOCIETY'S Institute of Technology

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Department of Electronics and Telecommunication Engineering

Semester III Scheme									
Course Type	Course Code	Course Name	Teaching scheme (Contact Hours)			Credits Assigned			
			Th	Pr	Tut	Th	Pr	Tut	Total
Programme Core Course (PCC)	26ETPC31	Electronic Devices and Circuits	3	2	--	3	1	--	4
Programme Core Course (PCC)	26ETPC32	Digital System Design	3	2	--	3	1	--	4
Programme Core Course (PCC)	26ETPC33	Network Theory & Control System	3	--	--	3	--	--	3
Programme Core Course (PCC)	26ETPC34	Mathematics for Communication	3	--	--	3	--	--	3
Multidisciplinary Minor (MDM)	26ETMM31	Computer Communication Network	3	2	--	3	1	--	4
Entrepreneurship Economics /Management Course (EM)	26ETEM31	Finance Management	2	--	--	2	--	--	2
Ability Enhancement Course (AEC)	26ETA31	Professional Communication and Ethics-II	1	2+ 2*	--	1	1	--	2
Total Credits						18	04	--	22



Department of Electronics and Telecommunication Engineering

Semester III Marks Scheme								
Course Type	Course Code	Course Name	TH	MT	CA	TW	PR/OR	Total
Programme Core Course (PCC)	26ETPC31	Electronic Devices and Circuits	60	20	20	25	25	150
Programme Core Course (PCC)	26ETPC32	Digital System Design	60	20	20	25	25	150
Programme Core Course (PCC)	26ETPC33	Network Theory & Control System	60	20	20	--	--	100
Programme Core Course (PCC)	26ETPC34	Mathematics for Communication	60	20	20	--	--	100
Multidisciplinary Minor (MD M)	26ETMM31	Computer Communication Network	60	20	20	25	25	150
Entrepreneurship/ Economics/Management Course (EM)	26ETEM31	Finance Management	30	20	--	--	--	50
Ability Enhancement Course (AEC)	26ETA31	Professional Communication and Ethics-II	--	--	--	25	25	50
Total Marks								750



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Semester III Syllabus

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Department of Electronics and Telecommunication Engineering

COURSE NAME: **ELECTRONICS DEVICES AND CIRCUITS**

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETPC31	Electronics Devices and Circuits (Theory)	03	---	---	03	---	---	03
26ETPCL31	Electronics Devices and Circuits (Lab)	---	02	---	---	01	---	01



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Electronics Devices and Circuits (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETPC31	<u>Electronics Devices and Circuits (Theory)</u>	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid Term Test	CA				
26ETPC31	<u>Electronics Devices and Circuits (Theory)</u>	20	20	60	---	---	100

Course Prerequisite: Engineering Physics, Basic Electrical Engineering

Course Objectives:

1	Know functionality and applications of various electronic devices.
2	Explain working of various electronics devices with the help of V-I characteristics.



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3	Derive expressions for performance parameters of BJT and MOSFET circuits.
4	Evaluate performance of electronic circuits (BJT and MOSFET based).
5	Select the appropriate circuit for the given application.
6	Design electronic circuit (BJT, MOSFET based) circuits for given specifications.
Course Outcomes: After successful completion of the course students will be able to:	
1	To explain functionality of different electronic devices.
2	To perform DC and AC analysis of small signal amplifier circuits.
3	To analyze small signal amplifiers & Multistage amplifiers.
4	To analyze frequency response of small signal amplifiers.
5	To analyze large signal amplifiers.

Electronics Devices and Circuits (Theory)

Module		Content	Hrs
1		Introduction of Electronic Devices	5
	1.1	Study of PN junction diode characteristics & diode current equation. Application of Zener diode as a voltage regulator.	
	1.2	Construction, working and characteristics of BJT, JFET, and E MOSFET	
2		Biasing Circuits of BJTs and MOSFETs	8
	2.1	Concept of DC load line, Q point and regions of operations, Analysis and design of biasing circuits for BJT (Fixed bias & Voltage divider Bias)	
	2.2	DC load line and region of operation for MOSFETs. Analysis and Design of biasing circuits for JFET (self-bias and voltage divider	



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		bias), E-MOSFET (Drain to Gate bias & voltage divider bias).	
3		Small Signal Amplifiers	7
	3.1	Concept of AC load line and Amplification, Small signal analysis (Z_i , Z_o , A_v and A_i) of CE amplifiers using hybrid pi model.	
	3.2	Small signal analysis (Z_i , Z_o , A_v) of CS (for E-MOSFET) amplifiers.	
4		Multistage amplifiers	6
	4.1	Introduction to multistage amplifiers. RC Coupling, Transformer coupling, Direct Coupling (Concept, advantages & disadvantages)	
	4.2	Effects of coupling, bypass capacitors and parasitic capacitors on frequency response of single stage amplifier, Miller effect and Miller capacitance	
5		Frequency response of small signal Amplifiers	7
	5.1	High and low frequency analysis of CE amplifiers.	
	5.2	High and low frequency analysis of CS (E-MOSFET) amplifiers.	
6		Large Signal Amplifiers:	6
	6.1	Difference between small signal & large signal amplifiers. Classification and working of Power amplifier	
	6.2	Analysis of Class A power amplifier (Series fed and transformer coupled).	
	6.3	Class B power amplifier and Class AB power amplifier.	
Total			39

Textbooks:



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1	D. A. Neamen, "Electronic Circuit Analysis and Design," Tata McGraw Hill, 3 rd Edition, 2013.
2	A. S. Sedra, K. C. Smith, and A. N. Chandorkar, "Microelectronic Circuits Theory and Applications," International Version, OXFORD International Students, 7 th Edition, 2017
3	Boylestad and Nashelsky, "Electronic Devices and Circuits Theory," Pearson Education, 11th Edition, 2013

Reference Books:	
1	Varsha Agrawal, Anil K. Maini, "Electronic Devices and Circuits," Wiley, 2009
2	T. L. Floyd, "Electronic Devices," Prentice Hall, 9th Edition, 2012.
3	S. Salivahanan, N. Suresh Kumar, "Electronic Devices and Circuits", Tata Mc-Graw Hill, 3rd Edition, 2012
4	Bell, David A. Electronic devices and circuits. Prentice-Hall of India, 5 th edition, 2008
Access to software and virtual labs:	
1	https://www.analog.com/en/resources/design-tools-and-calculators/ltspice-simulator.html
2	https://be-iitkgp.vlabs.ac.in/List%20of%20experiments.html

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) The duration of the midterm test shall be one hour.

Continuous Assessment:



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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/anyMOOC	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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Electronics Devices and Circuits (Laboratory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
26ETPCL31	Electronic s Devices & Circuits (Lab)	---	02	---	---	01	---	01

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid Term Test	CA				
26ETPCL31	Electronics Devices and Circuits (Lab)	---	---	---	25	25	50

Lab Prerequisite: Engineering Physics, Basic Electrical Engineering	
Lab Objectives:	
1	To make students familiar with equipment and measuring instruments used to perform Electronics Devices and Circuits laboratory work.
2	To provide hands on experience to develop laboratory setup for performing given experiments using various equipment, electronic devices and measuring



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	instruments.
3	To develop ability among students to gather appropriate data and analyse the same to relate theory with practical.
4	To develop troubleshooting abilities among students.
Lab Outcomes: After successful completion of the course students will be able to:	
1	Know various equipment, electronics devices and components, and measuring instruments used to perform laboratory work.
2	Students will be able to explain functionality of various equipment, electronics devices and components and measure instruments used to perform laboratory work.
3	Students will be able connect various equipment, devices, components and measuring devices using bread board as per the circuit diagram for experiment to be performed.
4	Students will be able to perform experiments to gather appropriate data.
5	Students will be able to analyze data obtained from experiment to relate theory with experiment results.
6	Students will be able to prepare laboratory reports (Journal) to summarise the outcome of each experiment.

Electronics Devices & Circuits (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 study PN junction diode characteristics.
2*	To study Zener as a voltage regulator.
3*	To study characteristics of CE configuration.



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4	To study BJT biasing circuits
5*	To study FET biasing circuits
6*	To study BJT as a CE amplifier.
7	To study frequency response of CE amplifier.
8*	To study EMOSFET biasing circuits.
9*	Simulation experiment on study of CS amplifier.
10	Simulation experiment on study frequency response of CS amplifier.
11*	Simulation experiment on study of differential amplifier.
12*	Simulation experiment on multistage amplifier.

Note: Suggested List of Experiments is indicative. However, flexibility lies with individual course instructors 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 8 experiments.
2	Journal must include at least 2 assignments.
3	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
4	Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks)



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COURSE NAME: DIGITAL SYSTEM DESIGN

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETPC32	Digital System Design (Theory)	03	---	---	03	---	---	03
26ETPCL32	Digital System Design (Lab)	---	02	---	---	01	---	01



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Digital system Design (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW /PR	Tut	Total
26ETPC32	Digital System Design (Theory)	03	--	-	03	--	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid Term Test	CA				
26ETPC32	Digital System Design (Theory)	20	20	60	---	---	100

Prerequisite: PCC- Digital System	
Course Objectives:	
1	To analyze, design and implement logical operations using various sequential logic circuits



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2	To study the finite state machines of sequential circuits
3	To learn basic concepts in Verilog and implement combinational and sequential circuits using Verilog
4	To understand timing requirements of sequential circuits
5	To study clocked synchronous state machine analysis
Course Outcomes:	
1	To analyze, design and implement sequential logic circuits.
2	To develop a digital logic and apply it to solve real life problems.
3	To analyze clocked synchronous State Machines.
4	To design clocked synchronous state machine
5	To simulate and implement basic sequential circuits using Verilog.

Digital system Design (Theory)

Module		Content	Hrs
1		Sequential Logic Circuit	6
	1.1	Sequential Design Latches, FFs, Shift registers, Counters design techniques, Deadlock condition, Bushing	
2		Clocked Synchronous State Machine Analysis	7
	2.1	Clocked Synchronous State Machine Analysis: State Machine Structure, Output logic, Characteristics equation	
	2.2	Analysis State Machine with DFF, Analysis State Machine with JK-FF	
3		Clocked Synchronous State Machine Design	8



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	3.1	State Table design Example, State assignment	
	3.2	State Minimization, Synthesis using D-FF and JK-FF Design state machine using state diagrams, The Guessing game	
4		Timing requirements of sequential circuits	6
	4.1	Setup time, Hold time, Clock skew, gating the clock, Synchronizer failure and metastability	
	4.2	Static timing analysis, Static and dynamic hazards, stuck in 0 Fault, Stuck In-1 fault.	
5		Introduction to VERILOG Programming	6
	5.1	Structure of Verilog code, gate level modelling Data types, blocking, non-blocking assignments, Dataflow, Behavioural and Structural programming style, Test bench	
6		HDL Programming using VERILOG	6
	6.1	Always block, initial block, finite state machine design, parameter and generic coding, tasks and functions	
		Total	39

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	Donald P. Leach, Albert Paul Malvino, Gautam Saha, "Digital Principles and Applications", The McGraw Hill, Eight Edition (2015).
4	Samir Palnitkar, "Verilog HDL A guide to Digital Design and Synthesis" , 2nd Edition, Pearson Education, (2009)



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5	Stephen Brown & Zvonko Vranesic, “Fundamentals of Digital Logic with Verilog Design”, Third Edition, MGH (2014).
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Reference Books:	
1	Thomas L. Floyd, “ <i>Digital Fundamentals</i> ”, Pearson Prentice Hall, Eleventh Global Edition (2015).
2	Mandal, “ <i>Digital Electronics Principles and Applications</i> ”, McGraw Hill Education, First Edition (2010).
3	Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, “ <i>Digital Systems Principles and Applications</i> ”, Ninth Edition, PHI (2009).
4	Donald P. Leach, Albert Paul Malvino, Gautam Saha, “ <i>Digital Principles and Applications</i> ”, The McGraw Hill, Eight Edition (2015).
5	Stephen Brown & Zvonko Vranesic, “ <i>Fundamentals of Digital Logic Design with VHDL</i> ”, Second Edition, TMH (2009).
6	J. Bhasker, “ <i>A Verilog HDL Primer</i> ”, Star Galaxy Press, Third Edition (1997).
7	Samir Palnitkar, “ <i>Verilog HDL A guide to Digital Design and Synthesis</i> ”, 2nd Edition, Pearson Education, (2009)
Access to software and virtual labs:	
1	https://cse15-iiith.vlabs.ac.in/List%20of%20experiments.html
2	https://da-iitb.vlabs.ac.in/List%20of%20experiments.html
Industry articles and case studies:	
1	https://ocw.snu.ac.kr/sites/default/files/NOTE/8867.pdf
2	https://courses.cs.washington.edu/courses/cse370/03au/lectures/05-CombEx.pdf
Any other (Access to AI tools / Data driven insights (if applicable) or any other):	



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1	https://www.cadence.com/en_US/home/solutions/cadence-jedai-solution.html
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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) The 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/anyMOOC	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



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

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
26ETPCL32	Digital System Design (Lab)	---	02	---	---	01	---	01

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid Term Test	CA				
26ETPCL32	Digital System Design (Lab)	---	---	---	25	25	50

Lab Prerequisite: PCC (Digital system design)	
Lab Objectives:	
1	To get familiarized with basic building blocks of Digital System Design and verify the operation of various digital ICs.
2	To train students to design and implementation of combinational circuits.



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3	To instruct students on how to design and implement sequential circuits.
4	To introduce simulation software like Verilog to design basic digital circuits.
Lab Outcomes: After successful completion of the course students will be able to:	
1	Students will be able to identify various Digital ICs and basic building blocks of digital system design.
2	Students will be able to design and implement combinational circuits like adder, subtractor, multiplexer, code converters etc.
3	Students will be able to identify and understand the working of various types of flip flops and their interconversions.
4	Students will be able to design and implement basic sequential circuits such as counters, registers etc.
5	Students will be able to acquire basic knowledge of Verilog basic programming.

Digital System Design (Lab)

Suggested Experiments: Students are required to complete at least 8 experiments.	
Star (*) marked experiments are compulsory.	
Sr. No.	Name of the Experiment
1*	Flip flop conversions JK to D, JK to T and D to T Flip Flop
2*	Design asynchronous/synchronous MOD N counter
3*	Verify different counter operations
4*	Verify shift register operations/modes
5	Implement and verify using test bench Data Flow code for different logic gates and adders using VERILOG



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6*	Implement and verify using test bench Behavioural code for mux and encoder using VERILOG
7	Implement FF's, Counter using VERILOG
8*	Implement traffic signal FSM and simulate using VERILOG
9*	State machine for one's counter using VERILOG
10*	Implement and verify Generic adder using VERILOG
11*	Implement Multiplier using VERILOG
12	Implement RAM using VERILOG

Term Work:	
1	Term work should consist of 8 experiments.
2	Journal must include at least 2 assignments.
3	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
4	Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks)



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COURSE NAME: **NETWORK THEORY AND CONTROL SYSTEMS**

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETPC33	Network Theory and Control Systems (Theory)	03	---	---	03	---	---	03



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Network Theory and Control Systems (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW /PR	Tut	Total
26ETPC33	Network Theory and Control Systems (Theory)	03	--	-	03	--	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid Term Test	CA				
26ETPC33	Network Theory and Control Systems (Theory)	20	20	60	---	---	100



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Course Prerequisite: Basic Electrical Engineering	
Course Objectives:	
1	To evaluate the Circuits using network theorems, study network Topology, network Functions and two port networks
2	To analyze the Circuits in time and frequency domain.
3	To synthesize passive networks by various methods.
4	To analyze fundamental concepts of mathematical modeling, time response and Frequency response.
5	To develop concepts of stability and its assessment criteria.
Course Outcomes: After successful completion of the course students will be able to:	
1	Apply circuit analysis techniques such as nodal, mesh, and network theorems to solve electrical circuits.
2	Analyze transient and steady-state response of first and second order electrical circuits.
3	Analyze two-port networks and synthesize one-port networks using Foster and Cauer methods.
4	Evaluate control systems using transfer functions, block diagrams, and time-domain specifications.
5	Determine system stability using time domain techniques Routh-Hurwitz criterion and Root Locus method.
6	Analyze system stability using frequency domain techniques such as Bode, Polar, and Nyquist plots.



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Network Theory and Control Systems

Module		Content	Hrs
1		Electrical circuit analysis	4
	1.1	Analysis of Circuits with dependent sources using generalized loop and node analysis, super mesh and super node analysis technique Network Theorems with dependent sources: Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems (Use only DC source)	
2		Time and frequency domain analysis	5
	2.1	Time domain analysis of R-L and R-C Circuits: Forced and natural response, initial and final values. Solution using first order and second order RC and RL Circuits with step signals.	
3		Network functions ,Two Port Networks and Network Synthesis	9
	3.1	Network functions for the one port and two port networks, driving point and transfer functions, Poles and Zeros of Network functions	
	3.2	Two Port Parameters: Open Circuits, short Circuit, Transmission and Hybrid parameters, relationship among parameters, conditions for reciprocity and symmetry	
	3.3	Positive Real Functions: Concept of positive real function, necessary and sufficient conditions for Positive real Functions. Synthesis of LC, RC & RL Circuits for one port Networks. LC, RC & RL network Synthesis in Cauer-I & Cauer-II , Foster- I & Foster-II forms.	
4		Analysis and response of control system	8
	4.1	Open and closed loop systems, Transfer function modeling (Electrical only), Block diagram reduction techniques and Signal flow graph	
	4.2	Dynamic Response: Standard test signals, transient and steady state behavior of first and second order systems, steady state errors in feedback control systems and their types	
5		Stability Analysis in Time Domain	6



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	5.1	Concept of stability: Routh and Hurwitz stability criterion	
	5.2	Root locus Analysis: Root locus concept, general rules for constructing root-locus, root locus analysis of control system.	
6		Stability Analysis in Frequency Domain	7
	6.1	Frequency domain specification, Relationship between time and frequency domain specification of system, stability margins	
	6.2	Bode Plot: Magnitude and phase plot, Method of plotting Bode plot, Stability margins and analysis using Bode plot. Concept of Polar plot	
		Total	39



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Textbooks:	
1	Franklin F Kuo, "Network Analysis and Synthesis", Wiley Toppan, 2nd ed. 2005.
2	M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 3rd Edition, 2019
3	I. J. Nagrath and M. Gopal, <i>Control Systems Engineering</i> , 8th Edition, New Age International Publishers, New Delhi, 2024.
4	C. S. Rangan, G. R. Sarma and V. S. V. Mani, <i>Instrumentation Devices and Systems</i> , 3rd Edition, McGraw-Hill Education (India), 2017
Reference Books:	
1	A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co., Delhi, 6th Edition, 2012
2	A. Sudhakar, Shyammoohan S. Palli "Circuits and Networks", Tata McGraw-Hill education, 5th Edition, 2017
3	K.S. Suresh Kumar, "Electric Circuit Analysis" Pearson, 2013.
4	D. Roy Choudhury, "Networks and Systems", New Age International, Reprint, 2005.
5	K. Ogata, <i>Modern Control Engineering</i> , 5th ed. Upper Saddle River, NJ, USA: Pearson Education, 2010.
6	N. S. Nise, <i>Control Systems Engineering</i> , 7th ed. Hoboken, NJ, USA: Wiley, 2015.



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Internal Assessment:

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

Continuous Assessment:-

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

Sr.no	Assessment Tools	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)	5 marks
8.	Multiple Choice Questions (Quiz)	5 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: MATHEMATICS FOR COMMUNICATION

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tut	Theory	TW/PR	Tut	Total
26ETPC34	Mathematics for Communication (Theory)	03	---	---	03	---	---	03



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Mathematics for Communication

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETPC34	Mathematics for Communication (Theory)	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	CA				
26ETPC34	Mathematics for Communication (Theory)	20	20	60	---	---	100

Course Prerequisite: Matrices and Differential Calculus, Integral Calculus and Complex Numbers

Course Objectives:

- | | |
|---|---|
| 1 | To build a strong foundation in mathematics, provide students with mathematics fundamentals necessary to formulate, solve and analyse complex engineering problems. |
| 2 | To prepare students to apply reasoning informed by the contextual knowledge to engineering practice, to work as part of teams on multi-disciplinary projects. |



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Course Outcomes:	
After successful completion of the course students will be able to:	
1	Understand and apply the fundamental concepts of linear algebra with applications to quantum mechanics and related fields.
2	Analyze the different Signals used in communication, control using Fourier Series.
3	Analyze the different systems like communication, control using Fourier transform.
4	Apply Z- transform and its properties to find the transform of a given function and analyse the digital systems.
5	Compute probability using probability distribution of discrete and continuous Random variable, Poisson and Normal distribution

Mathematics for Communication (Theory)

Module		Content	Hrs
1		Vector Calculus and Coordinate Transformations	8
	1.1	Vector Algebra: Scalars and vectors, Vector addition and subtraction, Dot product (scalar product), Cross product (vector product)	
	1.2	Vector Calculus: Gradient of scalar field, Divergence of vector field, Curl of vector field, Solenoidal and irrotational fields, Physical interpretation of Gradient, Divergence and Curl	
	1.3	Coordinate Systems: Cartesian coordinate system, cylindrical coordinate system, Spherical coordinate system. Conversion between Cartesian, Cylindrical, and Spherical coordinates, Geometry in Coordinate Systems, Unit vectors in Cartesian, cylindrical, and spherical coordinates, Jacobians and coordinate transformations	
2		Fourier Series	6
	2.1	Definition Of Fourier Series, Types-Trigonometric Form of Fourier Series,-Definition,Conditions for Existence of FourierSeries, Exponential Form of FourierSeries -Definition,NegativeFrequency,FrequencySpectrum(or Line Spectrum) of Periodic Continuous Time Signals.	



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	2.2	Fourier series of even and odd functions, Properties of Fourier Series, Gibbs Phenomenon, Relation Between Fourier Coefficients of Trigonometric and Exponential Form,	
3		Fourier transform	8
	3.1	Definition Fourier Transform, Fourier Transform of Standard Signals, Frequency Spectrum using Fourier Transform, Properties of Fourier Transform	
	3.2	Fourier Transform of aPeriodic Signal, Relation Between Fourier & Laplace Transform	
4		Z-Transform	8
	4.1	Definition of Z-transform, Region of Convergence, Properties of Z-Transform, Poles and Zeros of Rational Function of z, Representation of Poles and Zeros in z-plane, ROC of Rational Function of z	
	4.2	Inverse Z-Transform- Residue Method, Inverse Z-Transform by Partial Fraction Expansion Method, Inverse Z-Transform by Power Series Expansion Method, Relation Between Laplace Transform and Z-Transform	
5		Probability And Distribution Function	
	5.1	Discrete & continuous random variable with probability distribution Function & probability density function, probability mass function, properties of PDF and CDF	5
	5.2	Standard Probability Distribution: Binomial, Poisson and Normal Distribution	
6		Random Variable	4
	6.1	Function of random variables and their distribution and density functions.	
	6.2	Expectation, Variance, Moment Generating Function, Raw and central Moments, Covariance, Correlation coefficient and their properties	
		Total	39



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Textbooks:	
1	Nagoor Kani, Signals and Systems, Tata McGraw Hill, Third Edition, 2011.
2	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publication, Fifth Edition, 2016
3	T. Veerarajan, "Probability, Statistics and Random Processes", McGraw-Hill. Third Edition, 2016
Reference Books:	
1	Hwei. P Hsu, Signals and Systems, Tata McGraw Hill, Fourth edition, 2020
2	Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, 42th Edition, 2020
3	Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Limited, 10th Edition, 2021
4	Taub, Schilling and Saha, "Taub's Principles of Communication systems", Tata McGraw Hill, Fourth edition, 2013.
Access to software and virtual labs:	
	https://virtuallabs.merlot.org/vl_math.html
Any other (Access to AI tools / Data driven insights (if applicable) or any other):	
	https://www.mathworks.com/products/matlab.html
	https://www.scilab.org/



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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



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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.



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COURSE NAME: COMPUTER COMMUNICATION NETWORK (CCN)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theor y	Practical	Tutorial	Theory	TW/ PR	Tut	Total
26ETMM31	Computer Communication Network (Theory)	03	---	---	03	---	---	03

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Pract	Tut	Total
26ETMM31	Computer Communication Networks (Lab)	--	2	--	--	1	--	1



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COMPUTER COMMUNICATION NETWORK (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theor y	Practical	Tutorial	Theory	TW/ PR	Tut	Total
26ETMM31	Computer Communication Network	03	---	---	03	---	---	03

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	CA				
26ETMM31	Computer Communication Network	20	20	60	25	25	150

Course Prerequisite: Principal of Communication Engineering

Course Objectives:

1	To introduce networking architecture and protocols.
2	To understand and recognize the layer-wise functions, services, data formats, protocols, hardware devices and addresses in the TCP/IP architecture.
3	To build an understanding of application layer protocols.
4	To apply different addressing and routing schemes.

Course Outcomes:

After successful completion of the course students will be able to:

1	Analyze network topologies, hardware devices, addressing schemes and the protocol stacks.
2	Compare various transmission media and broadband technologies.



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3	Analyze the flow control, error control and the medium access control techniques.
4	Judge network layer addressing and routing schemes.
5	Analyze connection oriented and connectionless services.
6	Apply the knowledge of application layer protocols.

Computer Communication Network (Theory)

Module	Content	Hrs
1	Introduction to Network Architectures, Protocol Layers, and Service models	6
	1.1 Network types: LAN, MAN, and WAN, Network topologies. Protocols and standards, need of layered protocol architecture, OSI reference model	
	1.2 TCP/IP architecture: protocol suite, comparison of OSI and TCP/IP	
	1.3 Layer wise network hardware devices (NIC, Repeaters, Hubs, Bridges, Switches, Routers, Gateway and their comparison)	
	1.4 Addressing: physical / logical /port addressing/socket addressing.	
2	Physical Layer	4
	2.1 Guided transmission media: comparison among coaxial, optical fiber and twisted pair cables.	
	2.2 Unguided transmission media	
	2.3 Transmission impairments	
3	Data Link Layer	7
	3.1 Data link services: Framing, Flow control, Error control	
	3.2 ARQ methods: transmission efficiency, Piggybacking	
	3.3 High Level Data Link Control (HDLC): HDLC configurations, Frame formats, HDLC bit stuffing and de-stuffing, Typical frame exchanges.	
	3.4 Medium Access Control Protocols: ALOHA, Slotted ALOHA, CSMA, CSMA/CD	



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4		Network Layer	10
	4.1	Difference between circuit switching and Packet switching networks Network layer services and functions.	
	4.2	Internet Protocol: Principles of Internetworking, requirements, IPv4 packet, IPv4 addressing (classful and classless (CIDR)), Subnetting, supernetting, VLSM, and NAT	
	4.3	Routing in Packet Switching Networks: Characteristics, Routing strategies	
	4.4	Routing algorithms: Link state Routing, Distance vector Routing and Path vector routing, Routing protocols: RIP, OSPF, BGP	
	4.5	Introduction to ICMP, ARP, RARP	
	4.6	IPv6 (IPv6 Datagram format, comparison with IPv4, and transition from IPv4 to IPv6)	
5		Transport Layer	8
	5.1	Connectionless and Connection-oriented services at transport layer, Transmission Control Protocol (TCP): TCP Services, TCP Segment, TCP three way handshake	
	5.2	User datagram Protocol (UDP), UDP Services, UDP Datagram	
	5.3	TCP and UDP checksum calculation	
	5.4	Flow control, error control and congestion control	
6		Application Layer	4
	6.1	Introduction to Application layer Protocols: HTTP, FTP, DNS, SMTP, TELNET, DHCP	
		Total	
			39



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Textbooks:	
1	Data Communications and Networking – Behrouz A. Forouzan, Fifth Edition TMH, 2013
2	Computer Networks -- Andrew S Tanenbaum, 5th Edition, Pearson Education, 2013.
3	J J. F. Kurose and K. W. Ross,” Computer Networking: A Top-Down Approach”, Addison Wesley, 5th Edition, 2010.
Reference Books:	
1	Alberto Leon Garcia, “Communication Networks”, McGraw Hill Education, Second Edition, Fourth Edition, 2008.
2	An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education, 2015.
3	Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning
4	Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2014.

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



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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.



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Computer Communication Networks Lab

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract	Tut	Theory	Pract	Tut	Total
26ETMML31	Computer Communication Networks Lab	--	2	--	--	1	--	1

Prerequisite:

Lab Objectives:

1	To introduce networking architecture and protocols.
2	To understand and recognize the layer-wise functions, services, data formats, protocols, hardware devices and addresses in the TCP/IP architecture.
3	To build an understanding of application layer protocols.
4	To apply different addressing and routing schemes.

Lab Outcomes:

1	Design a small or medium sized computer network including media types, end devices, and interconnecting devices that meets a customer's specific needs.
2	Perform configurations on routers and Ethernet switches.
3	Demonstrate knowledge of programming for network communications.
4	Simulate computer networks and analyze the simulation results.
5	Troubleshoot connectivity problems in a host occurring at multiple layers of the OSI model.
6	Develop knowledge and skills necessary to gain employment as computer network engineer and network administrator.



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Suggested Experiments: Students are required to complete at least 8 experiments.

Star (*) marked experiments are compulsory.

Sr. No.	Name of the Experiment
1	To study basic networking commands. (Linux/Netkit)
2	To configure and compare different network topologies using Cisco Packet Tracer.
3	To study and compare network hardware components using Cisco Packet Tracer.
4	To configure static routes in a network using Cisco Packet Tracer.
5	To configure a network with Open shortest path first-OSPF using Cisco Packet Tracer and check the updated routing tables.
6	To configure a network with Path Vector Routing Protocol- BGP using Cisco Packet Tracer and check the updated routing tables..
7	To configure a network with Link state Routing Protocol- OSPF using Cisco Packet Tracer and check the updated routing tables.
8	To configure a network with Hybrid Routing Protocol- EIGRP using Cisco Packet Tracer and check the updated routing tables.
9	To perform subnetting using Cisco Packet Tracer/Netkit
10	To configure DNS, DHCP, TELNET, FTP, SMTP server (any one) on Cisco Packet Tracer
11	To Simulate and study stop and Wait protocol using NS 2.35/ C++
12	To Simulate Sliding Window protocol using NS 2.35/C++
13	To Simulate and study the implementation of TCP/IP stack using wireshark (observe the protocols, data formats, header structures, addresses, payload sizes and encapsulation at each layer)
14	To perform HDLC bit stuffing and de-stuffing using C++
15	To compare performance of ALOHA and Slotted ALOHA using Netsim.



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Term Work:	
1	Term work should consist of 8 experiments.
2	Journal must include at least 2 assignments.
3	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
4	Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks)
Continuous assessment exam	
1	Based on the subject and related lab



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COURSE NAME: FINANCE MANAGEMENT

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
26ETEM31	Finance Management (Theory)	02	---	---	02	---	---	02



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Finance Management (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETEM31	Finance Management (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	CA				
26ETEM31	Finance Management (Theory)	20	---	30	---	---	50

Course Objectives:

- 1 To know about the Indian financial system, instruments and market.
- 2 To understand the relationship between risk, return and time value of Money.
- 3 To understand the financial statements and ratio analysis.
- 4 To understand personal taxation.

Course Outcomes: Student will be able

- 1 To explain Indian financial system, instrument and market.
- 2 To determine risk, return and time value of Money with respect to financial decisions.
- 3 To decide investment decisions for projects with the help of financial ratios.



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4	To determine components involved in taxation
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Finance Management (Theory)

Module		Content	Hrs.
1		Indian Financial System	8
	1.1	Characteristics, Components and Functions of Financial System. Financial Instruments: Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, Treasury Bills, Trade credit.	
	1.2	Financial Markets: Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market	
	1.3	Financial Institutions: Meaning, Characteristics and Classification of Financial Institutions: Commercial Banks, Investment-Merchant Banks and Stock Exchanges	
2		Financial Risk and Returns	6
	2.1	Concepts of Returns and Risks: Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio	
	2.2	Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio.	
	2.3	Time Value of Money: Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting.	
3		Corporate Finance	6
	3.1	Overview of Financial Statements: Balance Sheet, Profit and Loss Account, and Cash Flow Statement.	
	3.2	Financial Ratio Analysis: Purpose of Financial Ratio Analysis. Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.	
4		Introduction to Taxation	6
	4.1	Introduction and Objectives, Assessment Year, Previous Year, Person	
	4.2	Assessee, Assessment, Income	
	4.3	Gross Total Income, Total Income, Scheme of charging income tax	



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	Total	26
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Reference Books:

1	Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.
2	Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers: McGraw Hill Education, New Delhi.
3	Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education, New Delhi.
4	Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) & Company Limited, New Delhi.

Industry articles and case studies:

1	Case Studies for five industry data using Front page Mobile app.
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Any other (Access to AI tools / Data driven insights (if applicable) or any other):

1	Analysis of the market for various industries using Mobile apps. Front Page
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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



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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

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: PROFESSIONAL COMMUNICATION AND ETHICS-II

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETAE31	Professional Communication and Ethics-II (Theory)	02	---	---	02	---	---	02



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Professional Communication and Ethics-II

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tut	Theory	TW/ PR	Tut	Total
26ETAE31	Professional Communication and Ethics-II (Theory)	01	01 (2 hours)*	---	01	01	---	02

* Students to be divided into Batches

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	Continuous Assessment				
26ETAE31	Professional Communication and Ethics-II (Theory)	---	---	---	50	---	50

Course Objectives:

1	To know about the Indian financial system, instruments and market.
2	To understand the relationship between risk, return and time value of Money.
3	To understand the financial statements and ratio analysis.
4	To understand personal taxation.

Course Outcomes: Student will be able

1	To explain the Indian financial system, instrument and market.
2	To determine risk, return and time value of Money with respect to financial decisions.
3	To decide investment decisions for projects with the help of financial ratios.



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4	To determine components involved in taxation
---	--

Module	Topics	Hours
1	ADVANCED TECHNICAL WRITING :PROJECT/PROBLEM BASED LEARNING (PBL)	6
	1.1 Definition, Purpose & Types of Proposals - Solicited & Unsolicited Proposals - Types (Short and Long proposals)	
	1.2 Parts of a Proposal - Elements - Scope and Limitations - Conclusion	
	1.3 Objectives of Report Writing - Information - Decision Making - Analysis - Recommendation	
	1.4 Parts of a Long Formal Report: - Prefatory Parts (Front Matter) - Report Proper (Main Body) - Appended Parts (Back Matter)	
	1.5 Language and Style of Reports - Tense, Person & Voice of Reports - Numbering Style of Chapters, Sections, Figures, Tables - Referencing Styles in APA & MLA Format - Proofreading through Plagiarism Checkers	
	1.6 Technical Paper Writing: - Parts of a Technical Paper - Language and Formatting - Writing an abstract - Referencing in IEEE Format	



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	1.7	Presenting data-figures, diagrams and labeling • Graphic Organizers for Summaries • Radial Diagrams like Mind Maps • Flow Charts • Cyclic Diagrams • Linear Diagrams like Timelines • Pyramids • Venn Diagrams	
2		EMPLOYMENT SKILLS	6
	2.1	Cover Letter & Resume • Parts and Content of a Cover Letter • Difference between Bio-data, Resume & CV • Essential Parts of a Resume • Types of Resume (Chronological, Functional & Combination)	

Reference Books:	
1	Lesiker and Petit (1997), "Report Writing for Business", McGraw-Hill Education 10 th edition
2	Butterfield, J. (2017). Verbal communication: Soft skills for a digital workplace. Boston, MA: Cengage Learning.
3	Bovée, C. L., & Thill, J. V. (2017). <i>Business communication today</i> , 14 th Edition, NJ: Pearson.
4	Robbins, S. P., Judge, T. A., & Campbell, T. T. (2017). <i>Organizational Behaviour</i> . Harlow, England: Pearson.
5	Fred Luthans. (2010). <i>Organizational Behavior</i> , McGraw Hill Education, 12 th edition
6	B N Ghosh(2017), <i>Managing Soft Skills for Personality Development</i> , Tata McGraw Hill Education.
7	R. C. Sharma, Krishna Mohan, Virendra Singh Nirban (2020). <i>Business Correspondence and Report Writing</i> , 6 th Edition, McGraw Hill
8.	Julie-Ann Amos (2004). <i>Handling Tough Job Interviews</i> Jaico Publishing House
References: Web Links	



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http://networketiquette.net/ https://public.wsu.edu/~brians/errors/ http://users3.ev1.net/~pamthompson/body_language.htm http://www.albion.com/netiquette/corerules.html http://www.bbc.co.uk/worldservice/learningenglish/radio/specials/1535_questionanswer/page15.shtml http://www.colostate.edu/Depts/Speech/rccs/theory44.html http://www.dailywritingtips.com

Term Work

Term Work will be for 50 - Marks as given below

Sr No	Headings	Marks
A	Assignments	10 Marks
B	Mini Project with Presentation	10 Marks
C	Media Studies	10 Marks
D	Book Report and Presentation	10 Marks
E	Group Discussion	10 Marks
	Total	50 Marks

- A) Assignments: List of assignments are as given below. The assignments have to be discussed in the group and approved by faculty. Each student in the group will have to write the assignments individually (10 Marks):

Sr No	List of Assignments
1.	Resume, Cover Letter and SOP
2.	Summarizing data figures into paragraphs (Module 1.7)
3.	Notice, Agenda and Minutes of Meeting
4.	Two case studies on Business Ethics
5.	Assignment on (Teamwork, Leadership, Decision Making and Problem Solving)

- B) Report on presentation: A detail typed report has to be prepared of minimum 25 pages and maximum 30 pages. The format of the report has to be discussed and approved by faculty.
- C) A final Group Discussion Round will be conducted and every student must participate in the group discussion.



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Semester IV Syllabus



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Semester IV Scheme									
Course Type	Course Code	Course Name	Teaching scheme (Contact Hours)			Credits Assigned			
			Th	P r	T u t	Th	Pr	Tu t	Tot al
Programme Core Course (PCC)	26ETPC41	Linear Integrated Circuits	2	2	--	2	1	--	3
Programme Core Course (PCC)	26ETPC42	Analog Communication	2	2	- -	2	1	--	3
Programme Core Course (PCC)	26ETPC43	Microprocessor & Microcontroller	2	2	- -	2	1	--	3
Multidisciplinary Minor (MDM)	26ETMM41	Cryptography & Ethical Hacking	3	2	- -	3	1	--	4
Open Elective (OE)	26OE4XX	Open Elective Course - I	4	--	-	4	-	-	4
Vocational and Skill Enhancement Course (VSEC)	26ETVS41	Skill Lab-1:Python Programming through Raspberry-Pi	--	2+2 *	- -	--	2	--	2
Field Project (FP)	26ETFP41	Field Project	--	4	- -	--	2	--	2
Entrepreneurship/ Economics/ Management Course (EM)	26ETEM41	Innovation and Entrepreneurship	-	-	2	-	-	2	2
Total Credits						13	08	2	23

* Tutorial for complete class



Department of Electronics and Telecommunication Engineering

Semester IV Marks Scheme								
Course Type	Course Code	Course Name	TH	M T	C A	T W	PR/ OR	Total
Programme Core Course (PCC)	26ETPC41	Linear Integrated Circuits	60	20	20	25	25	150
Programme Core Course (PCC)	26ETPC42	Analog Communication	60	20	20	25	25	150
Programme Core Course (PCC)	26ETPC43	Microprocessor & Microcontroller	60	20	20	25	25	150
Multidisciplinary Minor (MD M)	26ETMM41	Cryptography & Ethical Hacking	60	20	20	25	25	150
Open Elective (OE)	26OE4XX	Open Elective Course - I	-	--	-	--	--	100
Vocational and Skill Enhancement Course (VSEC)	26ETVS41	Skill Lab-1: Python Programming through Raspberry-Pi	--	--	--	25	25	50
Field Project (FP)	26ETFP41	Field Project	--	--	--	50	--	50
Entrepreneurship/ Economics/ Management Course (EM)	26ETEM41	Innovation and Entrepreneurship	--	--	--	25	-	25
Total Marks								825



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COURSE NAME: LINEAR INTEGRATED CIRCUITS

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theor y	Practical	Tutorial	Theory	TW/ PR	Tut	Total
26ETPC41	Linear Integrated Circuits (Theory)	02	---	---	02	---	---	02
26ETPCL41	Linear Integrated Circuits (Lab)	---	02	---	---	01	---	01



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Linear Integrated Circuits (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETPC41	Linear Integrated Circuits (Theory)	02	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	CA				
26ETPC41	Linear Integrated Circuits (Theory)	20	20	60	---	---	100

Prerequisite: Network Theory, Electronics Devices & Circuits

Course Objectives

1	To understand the concepts, working principles and key applications of linear integrated circuits.
2	To perform analysis of circuits based on linear integrated circuits.



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3	To design circuits and systems for particular applications using linear integrated circuits.
Course Outcomes: Students will be able to:	
1	Outline and classify all types of integrated circuits.
2	Understand the fundamentals and areas of applications for the integrated circuits.
3	Develop the ability to design practical circuits that perform the desired operations.
4	Understand the IC 555 timer and its applications.
5	Design voltage regulators for different applications.
6	Identify the appropriate integrated circuit modules for designing engineering applications.

Linear Integrated Circuits (Theory)

Module	Content	Hrs
1	Introduction to Operational Amplifier	5
	1.1 Block diagram of Op-Amp. Ideal and practical characteristics of op- amp.	
	1.2 Configurations of Op-Amp: Open loop and closed loop Configurations of Op-amp, Inverting and Non-inverting configuration of Op-amp and buffer.	
	1.3 Summing amplifier, difference amplifiers and Instrumentation amplifier using Op-amp.	
2	Linear Applications of Operational Amplifier	6
	2.1 Voltage to current and current to voltage converter.	
	2.2 Integrator & differentiator (ideal & practical), Active Filters: First and Second order active low pass, high pass, band pass, band reject and Notch filters.	
	2.3 Positive feedback, Burkhouse's criteria, Sine Wave Oscillators: RC phase shift oscillator, Wein bridge oscillator.	
3	Non-Linear Applications of Operational Amplifier	5
	3.1 Comparators: Inverting comparator, non-inverting comparator zero crossing detectors, Inverting Schmitt trigger	



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	3.2	Waveform Generators: Square wave generator and triangular wave generator, Half wave and full wave precision rectifiers.	
4		Timer IC 555 and it's applications	
	4.1	Functional block diagram and working of IC 555	
	4.2	Design of Astable and Monostable multivibrator using IC 555	4
	4.3	Applications of Astable and Monostable multivibrators as Pulse width modulation and Pulse Position Modulation.	
5		Voltage Regulators	4
	5.1	Functional block diagram, working and design of three terminal fixed voltage regulators (78XX, 79XX series).	
	5.2	Functional block diagram, working and design of general-purpose IC 723 (HVLC and HVHC), Introduction of LM 317	
6		Special Purpose Integrated Circuits	
	6.1	Functional block diagram and working of VCO IC 566 and application as frequency modulator.	2
	6.2	Functional block diagram and working of PLL IC 565 and application as FSK Demodulator.	
		Total	26

Textbooks	
1	Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, 4th Edition.(2015)
2	D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition.(2009)
Reference Books	



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1	K. R. Botkar, "Integrated Circuits", Khanna Publishers (2004) Tata McGraw Hill, 3rd Edition. University Press, Indian Edition.
2	Sergio Franco, "Design with operational amplifiers and analog integrated circuits", 4th Edition.(2014)
3	David A. Bell, "Operational Amplifiers and Linear Integrated Circuits", Oxford University Press,3rd Edition (2009)
4	R. F. Coughlin and F. F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Prentice Hall, 6th Edition.(2001)
5	J. Millman, Christos C. Halkias, and Satyabratatajit, Millman's, "Electronic Devices and Circuits," McGraw-Hill, 3rdEdition.(1967)

Access to software and virtual labs:

1	https://be-iitkgp.vlabs.ac.in/exp/non-inverting-amplifiers/
2	https://be-iitkgp.vlabs.ac.in/exp/operational-amplifier/
3	https://ltspice.en.softonic.com/

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



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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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Linear Integrated Circuits (Lab)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut	Total
26ETPCL41	Linear Integrated Circuits (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				
26ETPCL41	Linear Integrated Circuits (Lab)	---	---	---	25	25	50

Prerequisite: Basic Electrical Engineering, Electronic Devices & Circuits

Lab Objectives:

- | | |
|---|--|
| 1 | To understand the concepts, working principles and key applications of linear integrated circuits. |
| 2 | To perform analysis of circuits based on linear integrated circuits. |
| 3 | To design circuits and systems for particular applications using linear integrated circuits. |

Lab Outcomes:

- | | |
|---|---|
| 1 | Understand the differences between theoretical, practical and simulated results in integrated circuits. |
|---|---|



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2	Apply the knowledge to do simple mathematical operations.
3	Apply knowledge of op-amp, timer and voltage regulator ICs to design simple applications.

Linear Integrated Circuits (Laboratory)

Suggested Experiments: Students are required to complete at least 08 experiments.

Minimum 6 hardware practical (compulsorily based on IC 741, IC 555, IC 723 and remaining on VCO 566 or PLL 565) and 2 simulations should be conducted. At least one experiment from each Module of the syllabus.

Sr. No.	Name of the Experiment
1*	Design inverting, non-inverting amplifier and buffer using IC 741.
2	Design summing and difference amplifiers using op-amp.
3	Design voltage to current converter with grounded load.
4*	Design and analyze Integrator.
5*	Design and analyze Differentiator.
6*	Design Schmitt trigger using Op-amp.
7	Design Wein bridge and RC phase shift Oscillator.
8*	Design and analyze first or second order High pass and Low pass filter.
9	Design and analyze Band pass and Band reject filter.
10*	Design Astable multivibrator using IC 555 for fixed frequency and variable duty cycle.
11*	Design Monostable Multivibrator using IC 555.
12	Design voltage regulator using IC 723.
13	Design Frequency Modulator using IC 566.
14.	Design FSK Demodulator using IC 565.



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15.	Design Precision rectifier.
16.	Design Square & Triangular wave generator.

Note: Suggested List of Experiments is indicative. However, flexibilities lie with individual course instructors 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 Star (*) marked experiments are compulsory.

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: ANALOG COMMUNICATIONS

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tut	Theory	Pract	Tut	Total
26ETPC42	Analog Communication (Theory)	2	—	--	2	—	--	2
26ETPCL42	Analog Communication (Lab)		2	—	—	1	—	1



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Analog Communication (Theory)

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tut	Theory	Pract	Tut	Total
26ETPC42	Analog Communication	2	2	--	2	1	--	3

Course Code	Course Name	Examination Scheme						
		Theory				Term Work	Pract & oral	Total
		Internal Assessment		End Sem	Exam Duration			
		Mid Test (MT)	CA *	Exam	(Hrs)			
26ETPC42	Analog Communication	20	20	60	2	25	25	150

Course Prerequisite: Mathematics for communication, Electronic Devices and Circuits.

Course Objectives:

1	To illustrate the fundamentals of basic communication systems.
2	To understand various analog modulation and demodulation techniques.
3	To focus on applications of analog modulation and demodulation techniques.



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4	To explain the key concepts of analog and digital pulse modulation and demodulation techniques.
Course Outcomes: students should able to	
1	Explain the basic components and types of noises in communication system.
2	Analyze the concepts of amplitude modulation and demodulation.
3	Analyze the concepts of angle modulation and demodulation.
4	Compare the performance of AM and FM receivers.
5	Describe analog and digital pulse modulation techniques.
6	Illustrate the principles of multiplexing and demultiplexing techniques.

Module		Content	Hrs
1		Basics of Communication System	3
	1.1	Block diagram, electromagnetic spectrum, signal bandwidth and power, types of communication channels, Introduction to time and frequency domain. Basic concepts of wave propagation	
	1.2	Types of noise, signal to noise ratio, noise figure, noise temperature and Friss formula.	
2		Amplitude Modulation and Demodulation	8
	2.1	Basic concepts, need for modulation, waveforms (time domain and frequency domain), modulation index, bandwidth, voltage distribution and power calculations.	
	2.2	DSBFC: Principles, low-level and high-level transmitters, DSB suppressed carrier, Balanced modulators with diode (Ring modulator and FET) and SSB systems.	



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	2.3	Amplitude demodulation: Diode detector, practical diode detector, Comparison of different AM techniques, Applications of AM and use of VSB in broadcast television.	
3		Angle Modulation and Demodulation	
	3.1	Frequency and Phase modulation (FM and PM): Basic concepts, mathematical analysis, FM wave (time and frequency domain), sensitivity, phase and frequency deviation, modulation index, deviation ratio, bandwidth requirement of angle modulated waves, narrowband FM and wideband FM.	7
	3.2	Varactor diode modulator, Direct FM transmitter, indirect FM transmitter, Noise Triangle, pre- emphasis and de-emphasis.	
	3.3	FM demodulation: Balanced slope detector, Foster-Seely discriminator, Ratio detector amplitude limiting and thresholding, Applications of FM and PM.	
4		Radio Receivers	
	4.1	Characteristics of radio receivers, TRF, Super - heterodyne receiver block diagram, tracking and choice of IF, AGC and its types and Communication receiver.	3
	4.2	FM receiver block diagram, comparison with AM receiver.	
5		Analog and Digital Pulse Modulation & Demodulation	
	5.1	Sampling theorem for low pass signal, proof with spectrum, Nyquist Criteria, Sampling techniques, aliasing error and aperture effect.	3
	5.2	PAM, PWM, PPM generation, detection and applications. Basics of PCM system and differential PCM system. Concepts of Delta modulation (DM) and Adaptive Delta Modulation (ADM).	
6		Multiplexing & De-multiplexing	2



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	6.1	Frequency Division Multiplexing transmitter & receiver block diagram and applications. Time Division Multiplexing transmitter & receiver block diagram and applications.	
		Total	26

Textbooks:

1	Kennedy and Davis, "Electronics Communication System", Tata McGraw Hill, sixth edition, Published around 2017.
2	B.P. Lathi, Zhi Ding "Modern Digital and Analog Communication system", Oxford University Press, Fifth edition, 2019–2022 (international editions).
3	Wayne Tomasi, "Electronics Communication Systems", Pearson education, Fifth Edition, 2004.

Reference Books:

1	Taub, H., Schilling, D. L., & Saha, G., <i>Taub's Principles of Communication Systems</i> , 3rd Edition, Tata McGraw Hill, 2008.
2	Singh, P., & Sapre, S. D., <i>Communication Systems: Analog and Digital</i> , 3rd Edition, Tata McGraw Hill, 2012.
3	Haykin, S., & Moher, M., <i>Introduction to Analog and Digital Communications</i> , 2nd Edition, Wiley, 2007.
4	Roddy, D., & Coolen, J., <i>Electronic Communications</i> , 4th Edition, Pearson, 2011.
5	Frenzel, L. E., <i>Communication Electronics</i> , 3rd Edition, Tata McGraw Hill, 2002.



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Internal Assessment:

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- 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 assessment tools for continuous assessment will be considered on approval by the subject teachers. The Assessment Tools can be any 2 or max 4 of the following:-

Sr.no	Assessment Tools	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)	5 marks
8.	Multiple Choice Questions (Quiz)	5 marks



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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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Analog Communications (Lab)

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract	Tut	Theory	Pract	Tut	Total
26ETPCL42	Analog Communication Lab	--	2	--	--	1	--	1

Course Code	Course Name	Examination Scheme						
		Practical				Term Work	Pract & Oral	Total
		Internal Assessment		End Sem Exam	Exam Duration (Hrs)			
		Mid Term Test (MT)	CA*					
26ETPCL42	Analog Communication Lab	--	--	--	--	25	25	50

Prerequisite:		1. Usage of basic Electronic instruments and components. 2. Fundamentals of Electronic Devices and circuits
Lab Objectives:		
1	To give an understanding of Time and Frequency domain representation of signals.	
2	To demonstrate continuous wave modulation and demodulation.	
3	To demonstrate analog and digital pulse communication.	
4	Able to use simulation software to build communication circuits.	



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Lab Outcomes: Students should able to	
1	Analyze analog modulation techniques.
2	Analyze the waveforms of Radio receivers.
3	Implement analog pulse modulation and demodulation circuits.
4	Demonstrate digital pulse modulation and demodulation techniques.
5	Verify the concepts of TDM and FDM.

Suggested Experiments: Students are required to complete at least 10 experiments.	
Star (*) marked experiments are compulsory.	
Sr. No.	Name of the Experiment
1*	Generation of AM modulation and demodulation.
2	Analyze waveforms at various stages of SSB system.
3*	Generation of FM modulation and demodulation
4*	Analyze the output waveforms of each block of AM transmitter /receiver
5	Analyze the output waveforms of each block of FM transmitter /receiver
6	Design and implement Pre-emphasis and De-emphasis circuit.
7*	Verification of sampling theorem
8*	Generation of PAM modulation and demodulation.
9*	Generation of PWM and PPM modulation and demodulation.
10	Demonstrate Digital pulse transmission technique (PCM)
11	Demonstrate Digital pulse transmission technique (DM,ADM)
12	Observation of FDM multiplexing and de-multiplexing signals.



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13.	Observation of TDM multiplexing and de-multiplexing signals.
Term Work:	
1	Term work should consist of 10 experiments.
2	Journal must include at least 2 assignments.
3	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
4	Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks)

Useful Links:	
	https://swayam.gov.in/nd1_noc20_ee69/preview



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COURSE NAME: MICROPROCESSOR AND MICROCONTROLLERS (MPMC)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theor y	Practical	Tutorial	Theory	TW/ PR	Tut	Total
26ETPC43	Microprocessor and Microcontrollers (Theory)	02	---	---	02	---	---	02
26ETPCL 43	Microprocessor and Microcontrollers (Lab)	—	02	—	—	01	—	01



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Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETPC43	Microprocessor and Microcontrollers	02*	---	---	02	---	---	02

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	CA				
26ETPC43	Microprocessor and Microcontrollers	20	20	60	25	25	150

Course Prerequisite: Digital System Design	
Course Objectives:	
1	To equip students with the fundamental knowledge and basic technical competence in the field of Microprocessors and Microcontrollers.
2	To enable analysis and comparison of different microcontroller architectures such as 8051, ARM7, and STM32.
3	To impart programming skills for microcontroller-based systems using assembly language and embedded concepts.
4	To facilitate understanding of interfacing techniques and peripheral integration in embedded systems.
5	To promote the design and development of real-time microcontroller-based applications.
6	To expose students to modern embedded platforms and industry-relevant microcontroller technologies.



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Course Outcomes:

After successful completion of the course students will be able to:

1	Understand the architecture and pin configuration of 8086 Microprocessor
2	Understand the detailed architecture of 8051.
3	Write assembly language programs for 8051 microcontrollers.
4	Understand the features, architecture and instruction set of ARM7 Core.
5	Understand basics of STM microcontrollers.
6	Design an application using a microcontroller.

Microprocessor and Microcontrollers (Theory)

Module		Content	Hrs
1		8086 Microprocessor	4
	1.1	Introduction to 8086, features, architecture, pin description, memory banking, memory segmentation, External memory interfacing, and bus cycle	
	1.2	Maximum mode bus cycle, memory interfacing, Minimum mode System configuration, Maximum mode system configuration, Interrupts processing	
2		8051 Microcontroller	7
	2.1	Comparison between Microprocessor and Microcontroller	
	2.2	Features, architecture and pin configuration	
	2.3	Input / Output ports	
	2.4	Memory organization	
	2.5	Counters and timers	
	2.6	Interrupts	
3		8051 Assembly Language Programming and Interfacing	7
	3.1	Addressing modes, Assembler Directives, Instruction Set	
	3.2	Programs related to arithmetic, logical, delay subroutine, input/output ports, timers, counters, serial communication, and interrupts	
	3.3	Interfacing with LED displays, Keys and Stepper Motor	



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4		ARM7 Features and Applications	3
	4.1	Introduction and Features of ARM 7	
	4.2	Concepts of Cortex-A, Cortex-R, and Cortex-M	
	4.3	Architectural inheritance, Pipelining	
5		ARM7 Instruction Set and Programming	3
	5.1	Programmer's model	
	5.2	A brief introduction to exceptions and interrupt handling	
	5.3	Instruction set: Data processing, Data Transfer, Control flow, Programming	
6		ARM Cortex-M based microcontroller	2
	6.1	Understanding features, architecture & addressing modes of STM32.	
		Total	26

Textbooks:	
1	Krishna Kant, "Microprocessors and Microcontrollers", Prentice Hall of India, 2013.
2	M. A. Mazidi, J. G. Mazidi and R. D. Mckinlay, "The 8051 Microcontroller & Embedded systems", Pearson Publications, Second Edition 2006.
3	C. Kenneth J. Ayala and D. V. Gadre, "The 8051 Microcontroller & Embedded system using Assembly & 'C' ", Cengage Learning, Edition 2010.
4	Steve Furber, "ARM System on chip Architecture", Pearson, 2nd edition, 2001.
5	William Hohl, "ARM Assembly Language Fundamental & Techniques" CRC Press, Second Edition 2014.
6	Warren Gay, "Beginning STM32, 2018 edition.
Reference Books:	
1	Doughlas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH, 2012.



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2	"MCS@51 Microcontroller, Family User's Manual" Intel
3	James A. Langbridge, "Professional Embedded Arm Development", Wrox, John Wiley Brand & Sons Inc., Edition 2014.
4	M. A. Mazidi, Naimi, Chen, "ARM Assembly Language Programming & Architecture", MicroDigitalEd.com , Second Edition, 2016.
Access to software:	
	https://www.st.com/resource/en/datasheet/stm32f205rf.pdf
	http://www.tutorialspoint.com/index.htm http://www.tutorialspoint.com/microprocessor/microprocessor_8086_overview.htm
Any other (Access to AI tools / Data driven insights (if applicable) or any other):	
	https://www.geeksforgeeks.org/arithmetic-instructions-8086-microprocessor/
	https://onlinecourses.nptel.ac.in/noc20_ee11/preview
	https://nptel.ac.in/courses/108105102

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 approximately 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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End Semester Theory Examination:	
1	The question paper will be of 60 marks.
2	The 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.

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 in the class	05 Marks



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Microprocessor and Microcontrollers (Lab)

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract	Tut	Theory	Pract	Tut	Total
26ETPCL43	Microprocessor and Microcontrollers Lab	--	2	--	--	1	--	1

Course Code	Course Name	Examination Scheme						
		Theory						
		Internal Assessment		End Sem Exam	Exam Duration (Hrs)	Term Work	Pract & oral	Total
		Mid Test (MT)	Continuous Assessment (CA)					
26ETPCL43	Microprocessor and Microcontrollers Lab	--	--	--	--	25	25	50

Prerequisite:	
Lab Objectives:	
1	To understand and use development tools of microcontroller-based system design and debugging.
2	To develop and execute programs for various microcontroller operations and interfacing with I/O devices.
3	To develop microcontroller based applications.
4	To develop programs and applications based on STM32 board.
Lab Outcomes:	



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1	Use various development tools for microcontroller-based system design and debugging.
2	Develop and execute assembly language programs for arithmetic, logical, data transfer, and code conversion operations.
3	Develop and implement programs for interfacing general-purpose I/O, timers, and interrupts.
4	Interface and program input and output devices using microcontrollers.
5	Implement microcontroller-based applications.

Suggested Experiments: Students are required to complete at least 10 experiments.

Sr. No.	Name of the Experiment
1	Perform Arithmetic and Logical Operations (Using Immediate, Direct and Indirect addressing)
2	Code Conversion
3	Transfer of data bytes between Internal and External Memory
4	Experiments based on General Purpose Input-Output, Timers, Interrupts, Delay, etc.
5	Interfacing of Matrix Keyboard, LED, 7 Segment display, LCD, Stepper Motor, UART
6	Interfacing of STM32 with LED, Seven segment display, LCD, Keypad & Motors
7	Interfacing of STM32 with sensors like gas sensors, proximity sensors & temperature sensors.

Term Work:

1	Term work should consist of 10 experiments.
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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: 20-marks, Attendance Theory & Practical: 05-marks)
Practical & Oral Exam:	
1	Based on the experiments, practical exam and oral should be conducted.
2	Total 25 Marks



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Course Name: Cryptography and Ethical Hacking

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
26ETMM41	Cryptogra phy & Ethical Hacking	03	–	---	03	–	---	03
26ETMML41	Cryptogra phy & Ethical Hacking	–	02	---	–	01	---	01



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Cryptography and Ethical Hacking (Theory)

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
26NETMM41	Cryptogra phy & Ethical Hacking	03	02	---	03	01	---	04

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	CA				
26NETMM41	Cryptography & Ethical Hacking	20	20	60	—	—	100

Prerequisite: Computer Communication Networks

Course Objectives: Students will be learning,

1	To understand the fundamentals of Security.
2	To understand and apply Data encryption techniques.
3	To describe the need and procedure of Ethical hacking



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4	To understand the methodologies and techniques of Sniffing technique and web security
5	To understand the methodologies and techniques of hardware security.
Course Outcomes: Students should be able to,	
1	Demonstrate the core concepts of Cryptography
2	Compare Symmetric & Asymmetric Key Cryptography schemes and be able to apply different cryptography techniques.
3	Understand various security techniques
4	Interpret the knowledge of networking and ethical hacking.
5	Apply the knowledge of network reconnaissance to perform Network and web application-based attacks.
6	Apply the concepts of hardware elements and endpoint security to provide security to physical devices.

Cryptography and Ethical Hacking (Theory)

Module		Content	Hrs
1		Introduction to Security	7
	1.1	Security Goals, CIA triad, Attacks on CIA, Cryptography vs Steganography.	
	1.2	Symmetric Key cryptography: Substitution Cipher, Transposition Cipher, Stream and Block Cipher, DES- Methodology, Double DES, AES-Methodology	
2		Public Key Cryptography	9



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	2.1	Fermat's and Euler's Theorem, Chinese Remainder Theorem	
	2.2	Public key cryptography: Principles of Public Key Crypto System, RSA algorithm	
	2.3	Key management, KDC, Deffie-Hellman key exchange	
	2.4	Message Integrity, Message Authentication and Hash Functions, SHA, H MAC, Digital Signature Standards	
3		System Security	4
	3.1	Intrusion Detection System, IDS Vs IPS, Secure Electronic Transactions (SET)	
	3.2	Firewall- introduction, need and types of firewall	
4		Introduction to Ethical Hacking	5
	4.1	Hacking vs Cracking, Introduction to Ethical Hacking, Types of Hackers, Steps for ethical hacking, , Types of attacks on network, Information gathering, reconnaissance, scanning, vulnerability assessment, penetration testing, OpenVAS vs Nessus	
	4.2	System hacking: Password cracking attacks, Malware types: Trojan, worm, spyware, ransomware, rootkit, keylogger, logic bomb	
5		Hardware Security	6
	5.1	Hardware Vs. Software attacks, Types of Hardware attacks, Side channel attacks: Time channel attacks, Power analysis attack, Fault analysis attack, PUF (physical unclonable functions), Hardware Trojans.	
	5.2	Defense: Masking techniques, Hiding techniques.	
6		Wireless and Web Security	8
	6.1	Wireless Network security: hacking wireless networks (WEP, WPA,	



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		WPA- 2), Attacks on Wireless Network, Proxy network, VPN security	
	6.2	Web Security Considerations, Privacy on Web ,OWASP, Cookies, SSL, Attacks on web security: Account Harvesting, Web Bugs, Sniffing, ARP poisoning, Denial of service attacks, Hacking Web Applications, Clickjacking, Cross-Site scripting and Request Forgery, Session Hijacking and Management, Phishing and Pharming Techniques	
	6.3	Web Services Security : WAF, User Authentication, SSO, Web Service Security, Authorization, OAuth 2.0	
		Total	39



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Textbooks:	
1	William Stallings, "Cryptography and Network Security Principles and Practices", 4th Edition, Pearson Education, 2017
2	Marcelo Sampaio, "Cryptography and Network Security", River Publishers in Security and Digital Forensics, 2022
3	Security in Computing -- Charles P. Pfleeger, Sixth Edition, Pearson Education, 2023
4	Network Security and Cryptography -- Bernard Menezes, Cengage Learning, 2014
5	Hardware Security: A Hands-On Learning Approach- Swarup Bhunia, Mark T., Morgan Kaufmann(Elsevier), 1 st edition, 2018.
6	Network Security Bible -- Eric Cole, Second Edition, Wiley, 2011
7	Mark Stamp's "Information Security: Principles and Practice" --Deven Shah, Wiley, 2009
Reference Books:	
1	Bernard Menesez, "Network Security and Cryptography", 7th Edition, Delmar Cengage Learning, 2018.
2	Matt Bishop, "Computer Security Art and Science", Addison-Wesley, 2018
3	The Hardware Hacking Handbook: Breaking Embedded Security with Hardware Attacks- Jasper van Woudenberg, O'Flynn, 2021.
4	UNIX Network Programming –Richard Steven, Addison Wesley, 2003
5	Cryptography and Network Security -- Atul Kahate, 3rd edition, Tata Mc Graw Hill, 2013
6	Applied Cryptography, Protocols Algorithms and Source Code in C Bruce Schneier, 2nd Edition / 20th Anniversary Edition, Wiley, 2015



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Internal Assessment:

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

Continuous Assessment:-

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

Sr.no	Assessment Tools	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)	5 marks
8.	Multiple Choice Questions (Quiz)	5 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: Cryptography and Ethical Hacking (Lab)

Suggested List of Experiments:

1	Capture and analyze packets using Wireshark
2	Password strength analysis using online/ offline tools
3	Possible password (Wordlist) generation using Crunch tool
4	Implementation of Caesar cipher (Programming)
5	Implementation of AES encryption/decryption algorithm
6	Perform Digital signature creation and verification
7	Perform footprinting using WHOIS, nslookup
8	Passive reconnaissance using Google Dorking
9	Network scanning using nmap
10	Vulnerability scanning using OpenVAS/ Nessus
11	Capturing the session and Session hijacking using wireshark
12	Analysis of hardware vulnerabilities (case study based)
13	SQL injection attack simulation
14	Intercept requests using Burp Suit

Note: Suggested List of Experiments is indicative. However, flexibility lies with individual course instructors to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to



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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 8 experiments.

2. The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work. 4 Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments/ Micro/ Mini project/ Online platform simulation/ Challenges : 05-marks)



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COURSE NAME: SKILL LAB -I: Python Programming through Raspberry-Pi

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETVS41	SKILL LAB -I: Python Programming through Raspberry-Pi	--	2+2*	---	--	02	---	02

***2 Hours Tutorial + Project work [Not necessarily classroom teaching]**

Course Code	Course Name	Examination Scheme					
		Theory			Term Work	Practical & Oral	Total
		Internal Assessment		End Sem Exam			
		Mid-Term Test	CA				
26ETVS41	SKILL LAB -I: Python Programming through Raspberry-Pi	--	--	--	25	25	50

Course Prerequisite: C and Java Programming

Course Objectives:

1	To describe the core syntax and semantics of Python programming language.
2	To explore functions and decision flow control statements in Python
3	To infer the Raspberry-pi Programming and Sensor integration concepts.



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4	To formulate GUI Programming and image processing applications using Python.
5	To develop Raspberry-pi based applications using variety of python libraries and functions.
6	To automate the procedures with python programming
Course Outcomes: After successful completion of the course students will be able :	
1	Describe syntax and semantics in Python
2	Construct single valued and multi-valued functions along with control statements.
3	Interface various sensors, modules and, peripherals through Raspberry-pi
4	Design GUI in Python for hardware interface.
5	Develop image processing, computer vision application on Rasp-pi using Python.
6	Automate applications with file handling and libraries of python.

Skill Lab -I: Python Programming through Raspberry pi

Module		Content	Hrs
1		Introduction to Python and Raspberry-pi	6
	1.1	Overview of Raspberry Pi Models, Introduction to Python, Installation and resources.	
	1.2	Identifiers and Keywords, Comments, Indentation and Multi-lining, Variables (Local and Global), data types, Arithmetic, Operators, format, print, input, error statements.	
	1.3	Strings, Lists, Tuples, Dictionaries, Sets, Properties, Operations and methods.	
2		Functions and Decision flow control statement	6
	2.1	Functions: Built-in-functions, library functions, Defining and calling the functions, Return statements, Passing the arguments, Lambda Functions, Recursive functions.	
	2.2	Decision Flow Control Statement: if and else Nested If ,	



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		Loop Statement: While, do and while, for, Continue, Break and pass Statement, Conditional Statements.	
3		Embedded Programming with Raspberry Pi and Python	10
	3.1	Peripheral Interfacing: IR,LED, Buttons,, Push Buttons, Keypad, Seven Segment display, LCD Display, PWM.	
	3.2	Sensor Interfacing: temperature, humidity, motion, DHT11, Gas sensors.	
	3.3	Module Interfacing : LDR, Relay, Touch, Bluetooth, MPU-6050, Accelerometer and Magnetometer etc.	
4		Graphical User Interface and Image processing	10
	4.1	Graphical User Interface using Tkinter Library module, creating simple GUI; Buttons, Labels, entry fields, widget attributes.	
	4.2	Basic Image Processing using OpenCV library, simple image manipulation and enhancement.	
5		Raspberry Pi with OpenCV	10
	5.1	Introduction to python Library : 1. Numpy : Basic operation, mathematical functions on Ndarrays 2. Pandas : Dataframe, Data Operations, File operations. 3. Matplotlib : Line properties, Plots and subplots, Seaborn 4. Scipy : Scipy Sub packages – Integration and Optimization, Eigen values and Eigen Vectors, Statistic, Weave and IO.	
	5.2	Stream video over a local network using Flask or MQTT.	
	5.3	Communication Protocol Introduction (any 1) : I2C/SPI/UART	
6		Automation with Python	10
	6.1	File handling: Reading and writing files, Organizing files, working with excel, word, pdf, text, sending email, OS and SYS modules	



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	6.2	Application Development (which includes all above features like) GUI, OpenCV, Rasp-pi, sensors/module/camera/MQTT/Peripherals etc.	
		Total	52



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Textbooks:	
1	Yashavant Kanetkar, "Let us Python: Python is Future, Embrace it fast", 1st edition, BPB Publications (8 July 2019)
2	Simon Monk, "Raspberry Pi Cookbook"- For Raspberry Pi-based projects.
3	John Grayson, "Python and Tkinter Programming", Manning Publications (1 March 1999).
4	Dr. R. Nageswara Rao, Dreamtech Press, "Core Python Programming", 1st edition
5	James Payne, "Beginning Python: Using Python 2.6 and Python 3.1", Wrox publication
6	Joseph Howse, "Learning OpenCV 4 Computer Vision with Python" – For OpenCV and Computer vision applications.
7	Zed A. Shaw, "Learn Python the Hard Way: A Very Simple Introduction to the Terrifyingly Beautiful World of Computers and Code", Addison Wesley; 3rd edition (1 October 2013).
8	AL Sweigart, "Automate The Boring Stuff with Python"-Practical Programming for beginners
9	Bassem Aly, "Hands-on Enterprise Automation with Python", Packt publisher
10	Jamie Buelta, "Python Automation Cookbook", Packt publisher
Reference Books:	
1	George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems: Concepts and Design", 4th Edition, Pearson Education, 2005
2	Andreas C. Mueller, "Introduction to Machine Learning with Python", O'Reilly; 1 edition (7 October 2016)
3	David Beazley, Brian K. Jones, "Python Cookbook: Recipes for Mastering Python 3", O'Reilly Media; 3rd edition (10 May 2013).
4	Charles Platt, "Make : Electronics", O REILLY, First edition, 2009.



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Software Tools:

1. Python IDE: <https://www.python.org/downloads/>
2. Anaconda Environment: <https://www.anaconda.com/distribution/>
3. <https://www.raspberrypi.com/documentation/computers/getting-started.html>

Online Repository:

1. Github
2. Python 3 Documentation: <https://docs.python.org/3/>
3. "The Python Tutorial", <http://docs.python.org/release/3.0.1/tutorial/>
4. <http://spoken-tutorial.org>
5. Python 3 Tkinter library Documentation: <https://docs.python.org/3/library/tk.html>
6. Numpy Documentation: <https://numpy.org/doc/>
7. Pandas Documentation: <https://pandas.pydata.org/docs/>
8. Matplotlib Documentation: <https://matplotlib.org/3.2.1/contents.html>
9. Scipy Documentation : <https://www.scipy.org/docs.html>
10. Machine Learning Algorithm Documentation: <https://scikit-learn.org/stable/>
11. <https://nptel.ac.in/courses/106/106/106106182/>
12. NPTEL course: "The Joy of Computing using Python"

Suggested Experiments: Students are required to complete at least 10 experiments using Rasp-pi and sensors/peripheral interfacing.	
Sr. No.	Name of the Experiment
1	Write python programs to understand expressions, variables, quotes, basic math operations, list, tuples, dictionaries, arrays etc
2	Write a Python program to implement byte array, range, set and different STRING Functions (len, count, lower, sorted etc).
3	Write a Python program to implement control structures.
4	Assume a suitable value for distance between two cities (in km). Write a program to convert and print this distance in meters, feet, inches and centimetre.
5	Write a program to carry out the following operations on the given set s = {10, 2, -3, 4, 5, 88}



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	a. Number of items in sets s b. Maximum element in sets s c. Minimum element in sets s d. Sum of all elements in sets s e. Obtain a new sorted set from s, set s remaining unchanged f. Report whether 100 is an element of sets s g. Report whether -3 is not an element of sets s.
6	Write python program to understand different File handling operations
7	Create 3 lists – a list of names, a list of ages and a list of salaries. Generate and print a list of tuples containing name, age and salary from the 3 lists. From this list generate 3 tuples – one containing all names, another containing all ages and third containing all salaries.
8	Interfacing of Peripherals like Keypad, LCD display etc
9	Interfacing of sensors like IR, GAS, humidity , temperature etc.
10	Interfacing of modules LDR, Bluetooth etc.
11	If any integer is given as in input through the keyboard, write a program to find whether it is odd or even number.
12	If ages of Ram, Shyam, and Ajay are given as an input through the keyboard/keypad, write a program to determine the youngest of the three.
13	Write a program that prints square root and cube root of numbers from 1 to 10, up to 4 decimal places. Ensure that the output is displayed in separate lines, with number center-justified and square and cube roots right-justified.
14	Write a program that defines a function count_lower_upper() that accepts a string and calculates the number of uppercase and lowercase alphabets in it. It should return these values as a dictionary. Call this function for some sample strings.
15	A 5-digit positive integer is entered through the keyboard, write a recursive function to calculate sum of digits of 5-digit number.



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16	Write Python program to create, append, update, delete records from database using GUI.
17	Write Python program to obtain histogram of any image
18	Write a Python Program to split color image in R,G,B and obtain individual histograms.
19	Write Python program for histogram equalization
20	Write Python Program for edge detection
21	Write Python Program for image segmentation
22	Write Python program to implement GUI Canvas application using Tkinter
23	Write Python program to implement GUI Frame application using Tkinter
24	Write Python program to study define, edit arrays and perform arithmetic operations.
25	Write python program to study selection, indexing, merging, joining, concatenation in data frames
26	Evaluate the dataset containing the GDPs of different countries
27	Analyze the Federal Aviation Authority (FAA) dataset using Pandas to do the following: a. View: aircraft make name, state name, aircraft model name, text information, flight phase, event description type, b. fatal flag c. Clean the dataset and replace the fatal flag NaN with "No". d. Find the aircraft types and their occurrences in the dataset e. Remove all the observations where aircraft names are not available f. Display the observations where fatal flag is "Yes"
28	Analyze the "auto mpg data" and draw a pair plot using seaborn library for mpg, weight, and origin.
29	Write a python program to use SciPy to solve a linear algebra problem.



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30	Implement automation with python by reading, writing and managing excel file
31	Implement automation with python by reading, writing and managing csv file
32	Implement automation with python by reading, writing and managing word file
33	Creating a simple report using python

Term Work:	
1	Term work should consist of 10 experiments. Which must include 1. At-least 4 experiments of Sensor/peripherals and module interfacing. 2. Image processing experiments using python library and Rasp-pi. 3. Experiment on automation and file handling. 4. Group Project covering whole syllabus. ## Encourage students for coding using HackerRank
3	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
4	Total 25 Marks : 1. Experiments: 12-marks, 2. Attendance Theory & Practical: 05-marks, 3. Project: 05-marks, 4. Programming Activity like HackerRank/codechef: 3 marks.



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COURSE NAME: FIELD PROJECT

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW /PR	Tut	Total
26ETFP41	Field Project	---	04	---	---	02	---	02



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Field Project

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/PR	Tut	Total
26ETFP41	Field Project	---	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				
26ETFP41	Field Project	---	---	---	50	---	50



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Prerequisite: Basic Electrical Engineering, Electronic Devices and Circuits, Digital System Design, Linear Integrated Circuits.

Course Objectives:

1. To engage students in field visits, with an objective of identifying and formulating problem statements based on observations during visits in industry, Government/ Non-governmental organizations as well as the broader societal context. **(with reference to Scheme A).**

Students engage in experiential learning through developing industry or organizational case studies, analysing real-world processes, and proposing innovative enhancements based on critical observations and analysis **(with reference to Scheme B).**
This approach bridges academic theory with practical application, fostering deeper understanding and actionable insights for students.
2. To apply theoretical knowledge and foster creativity & innovation in addressing practical real-world problems.
3. To enhance student's analytical, design & problem-solving skills, increase student's critical thinking ability to engage them in lifelong learning.
4. To develop teamwork skills to achieve project goals and deadlines.

Course Outcomes:

1. To identify and resolve the issues with industry & society at large, to provide practical solutions for real-world challenges.
2. To implement novel and efficient solutions fostering interdisciplinary collaboration in addressing challenges
3. To apply appropriate techniques, resources and modern engineering tools, to improve the analytical, design, and problem-solving skills to abreast with the booming Technologies
4. Cultivation of effective teamwork abilities, facilitating collaboration and synergy among individuals to achieve common goals.



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Module	Content	Hrs
1	Project Planning and Proposal Development: Defining project objectives and scope, conducting literature review and background research, developing project proposal and timeline, Identifying required resources and constraints.	6
2	Design and Implementation: Selecting appropriate methodologies and Simulation tools, designing system architecture and components, Prototyping and testing system functionalities, iterative development and troubleshooting.	6
3	Documentation and Reporting: Maintaining detailed project documentation, Recording progress, challenges and solutions, Writing technical reports and documentation, Creating presentations for project updates and final presentation.	6
4	Project Presentation and Evaluation: Delivering oral presentations of project progress, demonstrating project outcomes and achievements, responding to questions and feedback from peers and instructors, reflecting on lessons learned and areas for improvement.	6
	Total	24

Text Books:	
1.	M. Rishardson and S Wallace, Getting started with Raspberry Pi, O'Reilly Pub, 2014.
2.	Simon Monk, Raspberry Pi Cookbook, O'Reilly Pub, 2014.
3.	Michael Morgolis, Arduino Cookbook, O'Reilly Pub, 2011.
4.	Yashavant Kanetkar and Shrirang Korde, 21 IoT Experiments, BPB Pub.
Access to Softwares: and Virtual Labs	
1.	Tinkercad : https://www.tinkercad.com/
2.	Proteus software



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3.	https://www.arduino.cc/
4.	https://www.raspberrypi.com/
5.	http://esp32.net/
6.	https://www.espressif.com/en/products/socs/esp32
Data Driven Insights and repositories:	
1	https://circuitdigest.com
2	www.Github.com
3	https://www.electronicshub.org

Termwork guidelines:



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1	Guideline to maintain quality of field project are as follows : Students can achieve this by making proper selection of projects based on field visit/ study of archives from the library. Encourage the use of open source softwares for simulation, design and documentation of the project. Project Topic selection and approval :- 1. The group may be of maximum FOUR (04) students. 2. The students are required to visit industry/community/library to identify the problem statement and be able to provide the proof of interaction. 3. Topic selection and approval by 2 Expert faculty from department at the start of semester. 4. Log Book to be prepared for each group to record the work per week by students. Weekly comment, remarks to be put by guiding faculty. Both students and faculty will put signatures in it per week. The log book can be managed online with proper authentication method using google sheets/forms or open source project management software. 5. Suggested steps for project selection and implementation as per scheme A. a. After identification of a problem statement during field visit, it is mandatory to design (analog+digital) sensor/IC based circuit on PCB in the project. Pure software projects will not be allowed. b. Application is made using PCB + Arduino (IDE)/ ESP32/Basic Raspberry-pi board. (Hardware + software co-design). (Project should be completely hardware based with minimal software use). c. Identification and testing of different components, instruments, simulation software for projects. d. Topic selected should be application based. The chosen topic should not belong to existing experiment list with medium/high difficulty level of implementation. e. Designing and analysing circuits by students using standard material and software. f. Initial project demonstration and testing is expected to be done by soldering on general purpose PCB. Discourage use of breadboards. g. Study of PCB, Simulation on software and making of final PCB layout for given circuit. h. Implementing the final circuits on PCB by mounting required components with application using Arduino. 6. Suggested list of components: Transistors, diodes, regulators, gates, counters, FF, Latches, Decoder, Mux, comparator, Adder, Subtractor, ALU, CPLDs, DC motors, resistor, capacitor, inductor, Op-amp etc.(Students may add more components as per the requirement of project)
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2	Project Report Format: 1. Project report should include the objectives, circuit diagram, operation, application, waveforms (if applicable), simulation results and final prepared PCB image, conclusion and references etc. 2. Report should not exceed 30 pages.
3	The final certification and acceptance of term work ensures satisfactory performance of project work and minimum passing marks in term work.
4	Term Work evaluation and marking as per Scheme A: 1. At the end of semester the above 2 expert faculty who have approved the topic will internally evaluate the performance. 2. Students have to give a presentation and demonstration on the Field Project. 3. In the evaluation each individual student should be assessed for his/her contribution, understanding and knowledge gained about the project completed. Based upon it the marks will be awarded to students. 4. <u>Distribution of 50 Marks for Term Work:</u> ● Initial Stage : Field study report and Project Proposal = 10 Marks ● Circuit simulation/ Zero PCB (GPP) implementation + Arduino Interfacing = 05 Marks ○ (Project review: Stage 1 and 2 will be evaluated in 3rd or 4th week of the semester). ● Project report: Circuit Design + Explanation + Analysis Results + Conclusion + References = 10 Marks ● Prototype Demonstration and Testing: PCB (simulation + Layout) + Final result with Arduino interfacing / ESP32/Basic Raspberry-pi board.+ Working Demo = 15 Marks ● Final Presentation and Report: PPT (upto 12 slides) + Answers given to Questions = 10 Marks



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Project selection, implementation and report writing with reference to Course Description B.

The student will mention the objectives of the field visit, description including field visit data collection, processes/ operations, analysis and suggestions for the improvement and innovations if any.

Distribution of 50 Marks for Term Work in scheme B is as follows:

1. Assessment of case study report with analysis prepared by student groups: **25 marks**
2. Presentation by student groups and Q&A: **15 marks**
3. Suggestions given for improvement in the present Processes/ Systems / Operations, innovation identification: **10 marks.**



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COURSE NAME: Introduction to Innovation and Entrepreneurship for Engineers

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ PR	Tut	Total
26ETEM41	Introduction to Innovation and Entrepreneurship for Engineers	—	---	02	--	--	02	02



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Introduction to Innovation and Entrepreneurship for Engineers

Course Code	Course Name	Teaching Scheme (Teaching Hours)			Credits Assigned			
		Theory	Practical	Tut	Theory	TW/PR	Tut	Total
26ETEM41	Introduction to Innovation and Entrepreneurship for Engineers	—	---	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				
26NETEM41	Introduction to Innovation and Entrepreneurship for Engineers	--	—	--	25	---	25

Course Prerequisite:

Course Objectives:

1	Understand the concepts and theories of innovation and entrepreneurship within engineering disciplines.
2	Develop critical thinking and problem-solving skills necessary for identifying and evaluating entrepreneurial opportunities.



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3	Gain practical experience in ideation, prototyping, and validation of innovative solutions to engineering challenges.
4	Explore the role of engineering in addressing societal and environmental challenges through innovation and entrepreneurship.
5	Cultivate teamwork, communication, and leadership skills essential for entrepreneurial success in interdisciplinary contexts.

Course Outcomes:

At the end of the course the student will gain the capability to:

1	Understand principles of innovation and entrepreneurship.
2	Identify and evaluate entrepreneurial opportunities.
3	Understand and Apply design thinking and innovation methodologies.
4	Develop and validate viable business models and innovative solutions.
5	Understand and demonstrate ethical practices in innovation and entrepreneurship
6	Demonstrate entrepreneurial mindset and skills.

Module	Contents	Hrs
1	Introduction to Innovation and Design Thinking	06
1.1	Overview of innovation concepts and importance in engineering.	
1.2	Types of innovation and innovation processes.	
1.3	Introduction to design thinking methodology.	
1.4	Applying design thinking principles to engineering challenges.	
1.5	Empathy mapping and user journey analysis.	
1.6	Iterative design process and user testing.	
2	Opportunity Identification, Ideation	04
2.1	Techniques for identifying customer needs and pain points.	
2.2	Idea generation exercises and brainstorming sessions.	



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2.3	Problem-solving through human-centered design.	
3	Prototyping and MVP Development	04
3.1	Introduction to prototyping techniques and tools.	
3.2	Minimum viable product (MVP) development and validation.	
3.3	Rapid iteration and feedback gathering.	
4	Introduction to Entrepreneurship	04
4.1	Overview of entrepreneurship concepts and mindset.	
4.2	Role of entrepreneurs in driving economic and social change.	
4.3	Characteristics of successful entrepreneurs. - Case Studies	
5	Business Model Innovation and Validation	04
5.1	Introduction to business model canvas and value proposition design.	
5.2	Revenue models, pricing strategies, and cost structure analysis.	
5.3	Techniques for market research and customer validation.	
5.4	Identifying target markets and understanding customer needs.	
6	Legal and Ethical Considerations	04
6.1	Intellectual property rights and patents in engineering innovation.	
6.2	Ethical considerations in entrepreneurship and engineering practice.	
6.3	Social responsibility and sustainability in innovation and entrepreneurship.	
	Total	26



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Textbooks:	
1	"Entrepreneurship Development and Small Business Enterprises" by Poornima M. Charantimath
2	"Innovation and Entrepreneurship: Practice and Principles" by Peter F. Drucker
3	"Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers" by Alexander Osterwalder and Yves Pigneur
4	"Innovative India: Science and Technology Entrepreneurship" by K. Vijayaraghavan and Rajan Srikanth
5	"Startup Nation: Making India a Startup Ecosystem" by Dr. H.K. Mittal
6	"Entrepreneurship: Theory, Process, and Practice" by Kuratko, Hornsby, and Covin:
7	"Zero to One: Notes on Startups, or How to Build the Future" by Peter Thiel and Blake Masters

Websites :	
1	Startup India (startupindia.gov.in): Provides resources, guidelines, and support for startups and entrepreneurs in India, including information on funding, policies, and events.
2	National Entrepreneurship Network (NEN) (wadhwanifoundation.org/national-entrepreneurship-network): Offers resources, workshops, and programs for entrepreneurship education and ecosystem development in India.
3	MIT OpenCourseWare (ocw.mit.edu): Offers free online courses on entrepreneurship and innovation, including lecture notes, assignments, and case studies from MIT's entrepreneurship curriculum.
4	Stanford eCorner (ecorner.stanford.edu) Features a rich collection of videos, podcasts, and articles on entrepreneurship and innovation from Stanford University, including talks by successful entrepreneurs and industry experts.
5	Coursera (coursera.org) Provides online courses on entrepreneurship and innovation from top universities and institutions, allowing students to learn at their own pace and earn certificates.



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6	TiE (The Indus Entrepreneurs) (tie.org) A global nonprofit organization dedicated to fostering entrepreneurship through mentoring, networking, and education, with many chapters in India offering local support and events.
Additional Resources:	
1	Entrepreneurship Development Institute of India (EDII) (ediindia.org) Provides entrepreneurship education, training, and research programs, as well as workshops and seminars on various aspects of entrepreneurship.
2	Harvard Business Review (hbr.org) Offers articles, case studies, and insights on innovation, entrepreneurship, and business strategy from industry experts and thought leaders.
3	Khan Academy (khanacademy.org) Offers free educational resources, including lessons on entrepreneurship, economics, and business fundamentals.

Term Work :	
The Assessment will be based on a set of 5 activities of 5 marks each.	
The suggested list of activities:	
1	Individual and group assignments (e.g., business model canvas, market research report).
2	Presentations and pitches for venture ideas.
3	Participation in discussions and workshops.
4	Reflection papers or journals documenting personal learning and growth.
5	Presentation of innovation projects by students.
6	Feedback and peer evaluation of prototypes.
7	Reflection on the innovation process and lessons learned.