Lokmanya Tilak Jankalyan Shikshan Santha's

Lokmanya Tilak College of Engineering

Sector 4, Vikas Nagar, Koparkhairane, Navi Mumbai 400709

An Autonomous Institute Affiliated to University of Mumbai

Department of Electronics & Telecommunication Engineering

CURRICULUM STRUCTURE

For

SECOND YEAR ENGINEERING

(BASED ON NEP 2020)

w.e.f. A.Y. 2025-26

Approved by Board of Studies on 05/04/2025

Approved by Academic Council on 15/04/2025

Department of Electronics & Telecommunication Engineering

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w.e.f. A.Y. 2025-26

Preface

Lokmanya Tilak College of Engineering (LTCE) is founded by a Nagpur-based trust known as Lokmanya Tilak Jankalyan Shikshan Sanstha (LTJSS). The Sanstha was established in 1983, by Honourable Dr. Satish Chaturvedi. At present, there are 28 educational institutes run by the Sanstha in Nagpur. The Sanstha derives its philosophy from the magnanimous mathematician, educationist, social reformer Lokmanya Bal Gangadhar Tilak, who dedicated his life for the cause of Swaraj. Lokmanya Tilak College of Engineering was established in 1994, approved by the All-India Council for Technical Education, New Delhi, recognised by the Govt. of Maharashtra, accredited by NAAC with 'A' grade and is affiliated to the University of Mumbai. Within the span of 30 years of its inception, LTCE has grown leaps and bounds in terms of popular courses being offered at U.G., P.G. and Ph.D. level. Four of its branches viz., Computer, Mechanical, Electrical and Electronics and Telecommunications Engg. have been accredited by NBA. The Institute runs the Under-graduate Programmes in Mechanical Engineering, Computer Engineering, Electronics & Telecommunication Engineering, Electrical Engineering, Computer Science & Engineering (Data Science), Computer Science & Engineering (Artificial Intelligence & Machine Learning) and Computer Science & Engineering (IoT & Cyber Security Including Blockchain Technology). Institute also offers Doctoral Programmes in Mechanical Engineering and Computer Engineering. LTCE stands steadfast in its mission of continuing efforts for the betterment of its students and society.

The National Education Policy 2020, recently implemented by the Government of India, envisions providing quality education to all young people, with the primary goal of nurturing well-rounded, thoughtful, and creative individuals. NEP 2020 also emphasizes the importance of developing character, ethical values, constitutional principles, intellectual curiosity, scientific temper, creativity, and other related virtues. The Government of Maharashtra has instructed autonomous colleges to update their curriculum and begin implementing the National Education Policy (NEP) 2020. We are fully committed to ensuring the effective and meaningful adoption of NEP 2020 in its true essence. At "Lokmanya Tilak College of Engineering", the holistic development of learners has always been our top priority and central focus. LTCE embraced the NEP philosophy as early as 2022 wherein we have introduced the concept of Honors and Minors programs on emerging fields as per the guidelines of University of Mumbai and in 2024, we proudly graduated our first batch under this holistic curriculum. The autonomous curriculum for 2024-28 is structured in line with the recommendations of NEP 2020, AICTE, and UGC. It now includes courses in emerging technologies and multidisciplinary areas to ensure relevance to industry and practical applications. Greater focus has been placed on experiential learning to move away from rote memorization.

Sd/-	Sd/-	Sd/-
Dr. Ravindra Duche	**Dr. Sheeba P. S.**	**Dr. Subhash K. Shinde**
BoS Chairman, EXTC	**Dean, Academics & Research**	**Principal**

Illustrative Semester wise Credit distribution structure for Four Year UG Engineering Program – One Major, One Multidisciplinary Minor as per Maharashtra State Govt. Resolution:

Courses		Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
Basic Science Course	BSC/ESC	6-8	8-10							14-18
Engineering Science Course		8-10	4-6							12-16
Programme Core Course (PCC)	Program Courses		2	8-10	8-10	10-12	8-10	4-6	4-6	44-56
Programme Elective Course (PEC)						4	8	2	6	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses			2	2	4	2	2	2	14
Open Elective (OE) Other than a particular program				4	2	2				8
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	2	2		2		2			8
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	2			2					4
Entrepreneurship/Economics/ Management Courses				2	2					4
Indian Knowledge System (IKS)			2							2
Value Education Course (VEC)				2	2					4
Research Methodology	Experiential Learning Courses								4	4
Comm. Engg. Project (CEP)/Field Project (FP)				2						2
Project									4	4
Internship/ OJT								12		12
Co-curricular Courses (CC)	Liberal Learning Courses	2	2							4
Total Credits (Major)		**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**160-176**

Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
2 Hr. Practical (P) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit

Credit Requirements for Award of Degree:

a) A total of 167 credits are required for a student to be eligible for the award of an **Undergraduate Degree in Engineering**, including a Multi-Disciplinary Minor, in accordance with the Government of Maharashtra GR dated 04/06/2024.

b) A student shall be eligible for the award of an **Undergraduate Degree** with **Honours/Minor** in Emerging Areas upon earning an additional **18 credits**.

Multiple Exits:

Students will have the flexibility to enter a programme in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs.

Distribution of Credits:

Level	Exit After Semester	Minimum Credits Required	LTCE Credits	Qualification Title	Additional Credit requirements
4.5	II (First Year)	40	44	One Year UG Certificate in relevant discipline	**8 credits** through Skill-based vocational courses (4 Credits) and Internship/ Apprenticeship/ Project (4 Credits).
5.0	IV (Second Year)	80	86	Two Years UG Diploma in relevant discipline	**8 credits** through Skill-based vocational courses (4 Credits) and Internship/ Apprenticeship/ Project (4 Credits).
5.5	VI (Third Year)	120	127	Three Years B. Voc. in the relevant Discipline	**8 credits** through Skill-based vocational courses (4 Credits) and Internship/ Apprenticeship/ Project (4 Credits).
6.0	VIII (Fourth Year)	160	167	B.Tech. in major discipline with multidisciplinary minor	-----
6.0	VIII (Fourth Year)	160+18= 178	167+18= 185	**B.Tech. in major discipline with double minor (Multidisciplinary and Emerging minor)**	--------

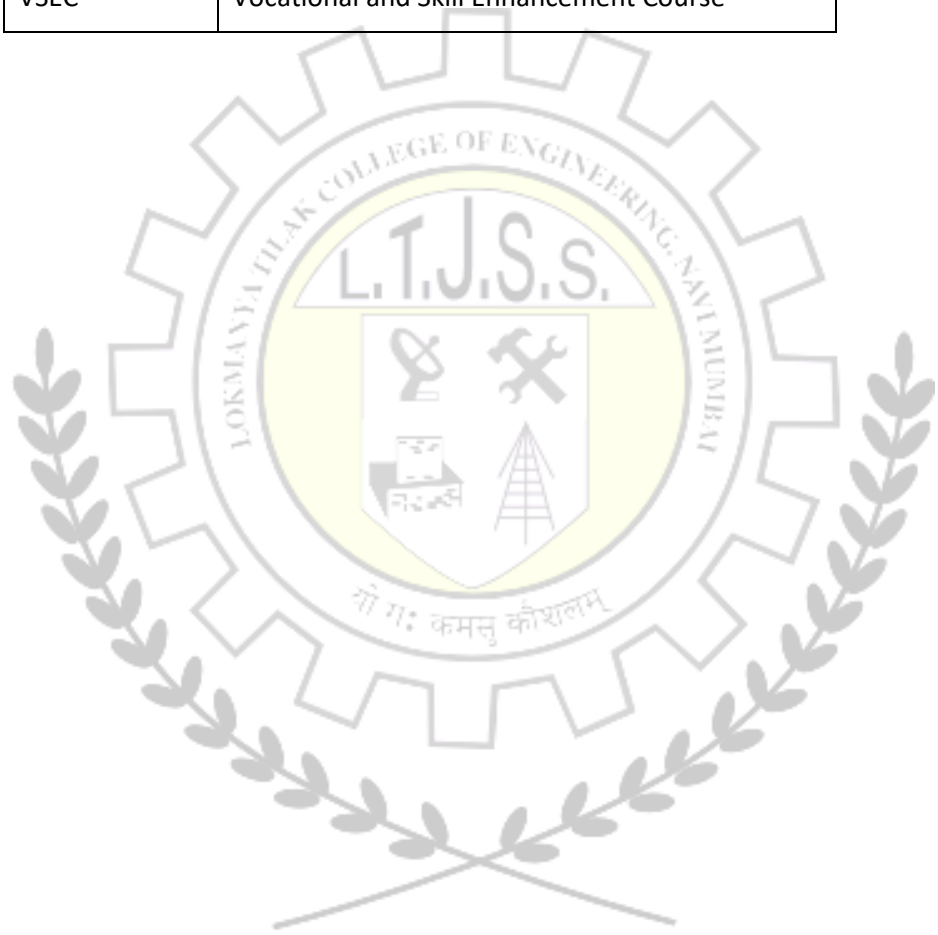
Type of Course	Course Code	No. of Credits as per Maharashtra Govt.	No. of credits as per LTCE
Basic Science Course	BSC	14-18	**16**
Engineering Science Course	ESC	12-16	**14**
Programme Core Course	PCC	44-56	**49**
Programme Elective Course	PEC	20	**19**
Multidisciplinary Minor	MDM	14	**14**
Open Elective (OE) Other	OE	8	**08**

than a particular program			
Vocational and Skill Enhancement Course	VSEC	8	**10**
Ability Enhancement Course (AEC -01, AEC-02)	AEC	4	**03**
Entrepreneurship/Economics/ Management Courses	EEMC	4	**04**
Indian Knowledge System (IKS)	IKS	2	**02**
Value Education Course (VEC)	VEC	4	**04**
Research Methodology	ELC	4	**03**
Comm. Engg. Project (CEP)/Field Project (FP)	ELC	2	**02**
Project	ELC	4	**04**
Internship/ OJT	ELC	12	**12**
Co-curricular Courses (CC)	CC	4	**03**
Total Credits (Major)		**160-176**	**167**
Total Credits (Major+ Honors/Minors)		**178-194**	**167+18=185**

Abbreviations:

AEC	Ability Enhancement Course
AEL	Ability Enhancement Laboratory
BSC	Basic Science Course
BSL	Basic Science Laboratory
CEP	Common Engineering Project
CC	Co-curricular courses
CIE	Continuous Internal Evaluation
ESC	Engineering Science Course
ESE	End Semester Exam
ESL	Engineering Science Laboratory
IKS	Indian Knowledge System
L	Lecture

MDM	Multidisciplinary Minor
MSE	Mid Semester Exam
OE	Open Elective
P	Practical
PCC	Programme Core Course
PCL	Programme Core Laboratory
PEC	Programme Elective Course
T	Tutorial
VEC	Value Education Course
VSEC	Vocational and Skill Enhancement Course



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Department of Electronics & Telecommunication Engineering

Second Year Engineering Scheme: Semester III (w.e.f. AY 2025-26)

Course Code	Course Name	Teaching Scheme		Credit Assigned		Total Credits	Examination Scheme					
							Internal Assessment		End Semester Exam		Oral &/ Practical	Total Marks
		L	P	L	P		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)	Marks	Duration (Hrs)		
ETESC301	Mathematics for Signal Analysis	3	--	3	-	3	20	20	60	2	--	100
ETPCC301	Digital System Design	3	--	3	-	3	20	20	60	2	--	100
ETPCC302	Electronics Devices & Integrated Circuit	3	--	3	-	3	20	20	60	2	--	100
OE301x	Open Elective Course	3	--	3	-	3	20	20	60	2	--	100
EEMC301	Entrepreneurship & Financial Management	2	--	2	-	2	20	20	60	2	--	100
VEC301	Environment & Sustainability	2	--	2	-	2	--	50	--	--		50
ETVSEC301	C++ and Java Programming	-	2*+2	-	2	2	--	25	--	--	25	50
ETPCL301	Digital System Design Lab	-	2	-	1	1	--	25	--	--	25	50
ETPCL302	Electronics Devices & Integrated Circuit Lab	-	2	-	1	1	--	25	--	--	25	50
Total		**16**	**08**	**16**	**4**	**20**	**100**	**225**	**300**	**10**	**75**	**700**

*Two hours of practical class to be conducted for full class as Theory Lecture.

OE301x: Open Elective Course	**OE3011**: Biology for Engineers	**OE3012**: Indian Constitution and Governance	**OE3013**: Human Psychology	**OE3014**: Disaster Management and Mitigation

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Department of Electronics & Telecommunication Engineering

Second Year Engineering Scheme: Semester IV (w.e.f. AY 2025-26)

Course Code	Course Name	Teaching Scheme		Credit Assigned		Total Credits	Examination Scheme					
							Internal Assessment		End Semester Exam			
		L	P	L	P		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)	Marks	Duration (Hrs)	Oral &/ Practical	Total
ETPCC401	Mathematics for Random Signals Analysis	3	--	3	--	3	20	20	60	2	--	100
ETPCC402	Analog and Digital Communication	3	--	3	--	3	20	20	60	2	--	100
ETPCC403	Microcontroller	3	--	3	--	3	20	20	60	2	--	100
XXMDM401	Multidisciplinary Minor	3	--	3	--	3	20	20	60	2	--	100
OE401x	Open Elective Course	2	--	2	--	2	20	20	60	2	--	100
EEMC401	Digital Business Management	2	--	2	--	2	--	50	--	--	--	50
VEC401	Business Communication Skills	--	2*+2	--	2	2	--	25	--	--	--	25
ETPCL402	Analog and Digital Communication Lab	--	2	--	1	1	--	25	--	--	25	50
ETPCL403	Microcontroller Lab	--	2	--	1	1	--	25	--	--	25	50
XXMDML401	Multidisciplinary Minor Lab	--	2	--	1	1	--	25	--	--		25
ETCEP401	Mini Project 1	--	2	--	1	1	--	25	--	--	25	50
Total		**16**	**12**	**16**	**06**	**22**	**100**	**275**	**300**	**10**	**75**	**750**

* Two hours of practical class to be conducted for full class as Theory Lecture.

OE401x: Open Elective Course	**OE4011**: Human Resource Management	**OE4012**: Corporate and Cyber Laws	**OE4013**: Stock Market and Personal Finance	**OE4014**: Nutrition Literacy and Health

Multidisciplinary Minor (MDM) (14 Credits)

Semester	Computer Engineering (CE)	Electronics & Telecommunication Engineering (ET)	Artificial Intelligence & Robotics (AR)	Internet of Things (IT)	Mechanical Engineering (ME)	Electrical Engineering (EE)
IV	**CEMDM401:** Data Structure and Algorithms	**ETMDM401:** Microprocessor and Microcontroller	**ARMDM401:** Artificial Intelligence	**ITMDM401:** Internet of Things and Applications	**MEMDM401:** Basics of Mechanical Engineering	**EEMDM401:** Elements of Electrical System
	CEMDML401: Data Structure and Algorithms Lab	**ETMDML401:** Microprocessor and Microcontroller Lab	**ARMDML401:** AI Lab	**ITMDML401:** Internet of Things Lab	**MEMDML401:** Mechanical Engineering Lab	**EEMDML401:** Elements of Electrical System Lab
V	**CEMDM501:** Database Management System	**ETMDM501:** Digital Communication & Sensor Technology	**ARMDM501:** Robotics	**ITMDM501:** Sensors, Actuators and Transducers	**MEMDM501:** Conventional & Renewable Energy Sources	**EEMDM501:** Special Machines and Smart grid
	CEMDML501: Database Management System Lab	**ETMDML501:** Digital Communication & Sensor Technology Lab	**ARMDML501:** Robotics Lab	**ITMDML501:** Sensors, Actuators and Transducers Lab	**MEMDML501:** Renewable Energy Sources Lab	**EEMDML501:** Special Machines and Smart grid Lab
VI	**CEMDM601:** AI & Soft Computing	**ETMDM601:** Digital Image Processing	**ARMDM601:** Industrial Automation	**ITMDM601:** Microcontrollers and Application	**MEMDM601:** Automobile System	**EEMDM601:** Electric Vehicle Technology
	CEMDML601: AI & Soft Computing Lab	**ETMDML601:** Digital Image Processing Lab	**ARMDML601:** Automation Lab	**ITMDML601:** Microcontrollers Lab	**MEMDML601:** Automobile Lab	**EEMDML601:** Electric Vehicle Technology Lab
VII	**CEMDML701:** Web Design Lab	**ETMDML701:** Mobile Computing Lab	**ARMDML701:** Predictive Maintenance Lab	**ITMDML701:** PLC and SCADA Lab	**MEMDML701:** 3D Printing Lab	**EEMDML701:** Design Management Auditing of Electrical System Lab

Open Elective Courses (OE) (8 Credits)

Semester	Course Code	Course Name
III	OE3011	Biology for Engineers
	OE3012	Indian Constitution and Governance
	OE3013	Human Psychology
	OE3014	Disaster Management and Mitigation
IV	OE4011	Human Resource Management
	OE4012	Corporate and Cyber Laws
	OE4013	Stock Market and Personal Finance
	OE4014	Nutrition Literacy and Health
VIII	OE8011	Intellectual Property Rights (IPR) and Patents
	OE8012	Risk Management
	OE8013	Economics for Engineers
	OE8014	Innovation and Startups

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ETESC301	Mathematics for Signal Analysis	20	20	60	1	2	100	

Prerequisite: Applied Mathematics-I Applied Mathematics-II	
Course Objectives: The course aims	
1	To introduce basic concepts of signals and systems, their different types and classification
2	To analyse LTI systems using convolution, impulse response and system properties like causality, stability and linearity.
3	To apply Fourier transform and its properties to analyse signals in frequency domain
4	To apply Laplace transform and Z-transform for system analysis
Course Outcomes: Learners will be able to	
1	Understand and classify different types of signals
2	Understand and classify different types of systems
3	Analyse continuous time and discrete time LTI signals and systems in time domain
4	Apply concepts of Fourier transform for analysis of continuous and discrete time signals and systems
5	Apply concepts of Laplace Transform for analysis of continuous time signals and systems in frequency domain
6	Apply concept of Z-Transform for analysis of discrete functions/signals

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction to signals** Definition of Signal, Basic Elementary signals - exponential, sine, step, impulse, ramp, rectangular, triangular. Operations on signals, time operations and amplitude operations, Classification of signals, Analog and discrete time signals, even and odd signals, periodic and non-periodic signals, deterministic and nondeterministic signals, energy and power signals.	6	CO1
02	**Introduction to systems** System and classification of System, system representation, continuous time and discrete systems, System with and without memory, causal and non-causal system, anticausal, linear and	6	CO2

	nonlinear system, Time invariant and time variant system, stable, unstable system		
03	**Time domain analysis of continuous time and discrete time systems** Linear Time Invariant (LTI) systems, Representation of systems using differential /difference equation, Impulse, step and exponential response, System Stability and Causality, use of convolution integral (using analytical and graphical method) for analysis of continuous LTI system, Use of convolution sum (analytical method, matrix method, tabular method, graphical method) for analysis of discrete LTI systems, Properties of convolution integral/sum, impulse response of interconnected systems.	**8**	**CO3**
04	**Fourier analysis of continuous and discrete time signals and systems** Fourier transform, Properties of Fourier Transform, Inverse Fourier Transform, Frequency Response, computation of Magnitude and Phase Response, Limitations of Fourier Transform.	**6**	**CO4**
05	**Laplace transform and continuous time LTI systems** Need of Laplace Transform, Concept of Region of Convergence, Properties of Laplace Transform, Relation between continuous time Fourier Transform and Laplace Transform, Unilateral Laplace Transform, causality and stability of system in S domain, Total response of the system. Inverse Laplace transform using partial fraction method and convolution.	**8**	**CO5**
06	**Z transform for discrete time systems** Need of *z*-Transform, *z*-Transform of finite and infinite duration sequences, Concept of Region of Convergence, *z*-Transform properties, Standard *z* transform pairs, Relation between *z*-transform and discrete time Fourier Transform, One sided *z*-Transform. Inverse *z*-Transform using Partial Fraction method only. Systems characterized by Linear constant coefficient difference equation, Transfer Function, plotting Poles and Zeros of a transfer function, Causality and stability of systems, Total response of a system.	**8**	**CO6**
	Total	**42**	

Text Books:

1. Signals and Systems, A Nagoor Nani, Tata McGraw Hill.
2. Rodger E Ziemer, William H. Tranter and D. Ronald Fannin, Signals and Systems, Pearson Education, Fourth Edition 2009.
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication
4. Alan V. Oppenhiem, Alan S. Willsky and S. Hamid Nawab, Signals and Systems, Prentice-Hall of India, Second Edition, 2002.
5. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication.

References:

1. https://archive.nptel.ac.in/courses/108/104/108104100/
2. https://www.youtube.com/@nptel-nociitm9240

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ETPCC301	Digital system Design	20	20	60	1	2	100	

Prerequisite: Basic Electrical Engineering	
Course Objectives: The course aims to	
1	Understand number system representations and their inter-conversions used in digital electronic circuits.
2	Describe and analyse the functionalities, and Characteristics of Logic Families and Minimization techniques to realise logical operations and combinational logic circuits
3	Design and implement the logical operations using different sequential logic circuits, various registers, counters, and programmable logic devices.
4	Apply the basics of VHDL language.
Course Outcomes: Learners will be able to	
1	Apply the concepts of number systems and perform code conversions.
2	Classify logic families, understand Digital circuits and apply minimization techniques to implement logical functions
3	Design and implement combinational logic circuits
4	Analyse and implement sequential logic circuits.
5	Design and implement digital circuits using different registers, counters, and programmable logic devices.
6	Apply the basics VHDL for logic design.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Number Systems and Codes** Review of Binary, Octal and Hexadecimal Number Systems, their inter-conversion, Gray code and BCD code, Binary Addition, Subtraction using 1's and 2's Complement method.	03	CO1
02	**Logic families and Minimization Techniques** Classification of logic families: Unipolar and Bipolar Logic Families, Characteristics of Digital ICs, TTL and CMOS comparison.	08	CO2

	Digital logic gates, Universal gates, Realization using NAND and NOR gates, Boolean Algebra, De Morgan's Theorem. Minimization of Boolean expressions:- SOP, POS, and Karnaugh map (up to 4 variables)		
03	**Combinational Logic Circuits** Adder, Subtractor, Multiplexer, De-multiplexer, Code Converter, BCD adder, Magnitude Comparator, Parallel Adder, Implementation of Logic expressions using Multiplexers, De-multiplexers, Encoders and Decoders.	**08**	**CO3**
04	**Sequential Logic Circuits** Flip flops (FF): SR, JK, T, D, Master Slave JK flip flops, Truth table, excitation table, triggering methods, and flip flop conversions. Counters: Asynchronous and Synchronous - MOD N, UP/DOWN, Decade counter, Frequency division, Finite State Machine: Introduction to Moore and Mealy machines - Block diagram, state diagram, state tables.	**10**	**CO4**
05	**Shift Registers and Programmable Logic Devices** Registers: SISO, SIPO, PISO, PIPO, Universal Shift registers, Ring counter, Johnson counter, Sequence generator. Structure of Programmable Logic Devices (PLDs), Function implementation with Programmable Logic Array (PLA) and Programmable Array Logic (PAL). Introduction to CPLD and FPGA.	**08**	**CO5**
06	**Introduction to VHDL** VLSI Design flow (Frontend): Design entry: Schematic different modeling styles in VHDL, Data types and objects, Synthesis and Simulation, implementation of combinational and sequential logic using VHDL.	**05**	**CO6**
	Total	**42**	

Text Books:

1. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publication, 4th Edition.
2. Morris Mano, Michael D. Ciletti, "Digital Design", Pearson Education, Fifth Edition (2013).
3. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI, Fourth Edition (2016).
4. J. Bhaskar A Verilog HDL Primer, Third Edition, Star Galaxy publishing
5. Sameer Palnitkar "Verilog HDL, A guide to digital
6. Douglas Perry, "VHDL programming", McGraw Hill, fourth edition.

References:

1. John F. Warkerly, "Digital Design Principles and Practices", Pearson Education,Fifth Edition (2018).
2. Digital fundamentals by FLOYD & JAIN, Pearsons Pub
3. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill
4. https://www.tutorialspoint.com/digital circuits
5. https://swayam.Nov.in/nd1_noc19_ee51
6. https://swayam.Nov.iWnd l_noc l9_cs74

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

5. Assignment: 5 Marks
6. Quiz/Open book test/Presentation: 10 Marks
7. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ETPCC302	Electronics Devices & Integrated Circuit	20	20	60	1	2	100	

Prerequisite: 1.Engineering Physics-I(BSC102) 2.Engineering Physics-II(BSC202 3.Basic Electrical Engineering.(ESC102)	
Course Objectives: The course aims to	
1	Explain functionality different electronic devices.
2	Perform DC/AC analysis of small signal CE/CS amplifier circuits
3	Describe functionality of differential amplifiers and it's applications
4	Evaluate performance of special ICs
Course Outcomes: Learners will be able to	
1	Know functionality and applications of various electronic devices with the help of V-I characteristics.
2	Derive expressions for performance parameters of BJT and JFET circuits.
3	Evaluate performance of Electronic circuits (BJT and JFET based)
4	Outline and classify all types of integrated circuits for different application.
5	Describe the fundamentals and areas of applications for the integrated circuits
6	Identify the appropriate integrated circuit modules for designing engineering application

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction of Electronic Devices**	03	CO1
	Study of pn junction diode characteristics & diode current equation. Construction, working and characteristics of BJT, JFET, and introduction to MOSFET and its types.		
	Self Learning Topic:.Transistor as Switch		
02	**Biasing Circuits of BJTs and JFFETs**	09	CO2
	Concept of DC load line, Q point and regions of operations, Analysis and design of biasing circuits for BJT (Fixed bias & Voltage divider Bias)		

	DC load line and region of operation for JFET Analysis and design of biasing circuits for JFET (self bias and voltage divider bias), **Self Learning Topic: compare Thermal stability of different types BJT biasing circuits.**		
03	**Small Signal Amplifiers** Concept of AC load line and Amplification, Small signal analysis (Zi, Zo, Av and Ai) of CE amplifier using hybrid pi model. Small signal analysis (Zi, Zo, Av) of CS (for JFET) amplifiers. Introduction to multistage amplifiers and power amplifier (Concept, advantages & disadvantages) **Self Learning Topic: frequency response of CE/CS amplifier**	**08**	**CO3**
04	**Introduction to Operational Amplifier** Block diagram of Op-Amp and its parameter. Ideal and practical characteristics of op-amp. Configurations of Op-Amp: Open loop and closed loop configurations of Op-amp, Inverting and Non-inverting configuration of Op-amp General operational amplifier stages -and internal circuit diagrams of IC 741.	**08**	**CO4**
	Self Learning Topic:IC fabrication Method.		
05	**Linear and Nonlinear Applications of Operational Amplifier** Integrator & Differentior (ideal & practical), Voltage follower Non-Linear op-amp circuits: Rectifier, Clipper, Clamper Schmitt Triggers: Inverting Schmitt trigger, non-inverting Schmitt trigger Positive feedback, Barkhausen's criteria, Sine Wave Oscillators: RC phase shift oscillator, Wien bridge oscillator. **Self Learning Topic:LC oscillator.**	**09**	**CO5**
06	**Special purpose Integrated Circuits**		
	Functional block diagram and working of IC 555, IC565, IC 566 Voltage Regulators 78XX,79XX, LM317	**05**	**CO6**
	Self Learning Topic: Multivibrator		
	Total	**42**	

Text Books:

1. D. A. Neamen, "Electronic Circuit Analysis and Design," Tata McGraw Hill, 2ndEdition.
2. A. S. Sedra, K. C. Smith, and A. N. Chandorkar, "Microelectronic Circuits Theory and Applications," International Version, OXFORD International Students, 6thEdition
3.. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, 4th Edition.
4 D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition.

References

1. Boylestad and Nashelesky, “Electronic Devices and Circuits Theory,” Pearson Education, 11th Edition.
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
4.K. R. Botkar, “Integrated Circuits”, Khanna Publishers (2004)
5. J. Millman, Christos CHalkias, and Satyabratatajit, Millman’s,“Electronic Devices and Circuits,” McGrawHill, 3rdEdition.

NPTEL/ Swayam Course:

1. Course: Analog Electronic Circuit By Prof. Shouribrata chatterjee (IIT Delhi); https://swayam.gov.in/nd1_noc20_ee89/preview

2. Course: ICs MOSFETs Op-Amps & Their Applications By Prof. Hardik Jeetendra Pandya (IISc Bangalore); https://swayam.gov.in/nd1_noc20_ee13/preview

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
OE3011	Biology for Engineers	20	20	60	1	2	100	

Prerequisite: Basic concepts of core sciences like physics, chemistry, and mathematics	
Course Objectives: The course aims to	
1	To familiarize the students with the basic biological concepts and their engineering applications.
2	To enable the students with an understanding of biodesign principles to create novel devices and structures.
3	To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems
4	To motivate the students develop the interdisciplinary vision of biological engineering.
Course Outcomes: Learners will be able to	
1	Understand the biological concepts from an engineering perspective.
2	Understand the artificial systems mimicking human action and collaborate the concepts of biomimetics for specific requirements.
3	Elucidate the basic biological concepts via relevant industrial applications and case studies.
4	Think critically towards exploring innovative biobased solutions for socially relevant problems.
5	Evaluate the principles of design and development, for exploring novel bio-engineering projects.
6	Integrate biological principles for developing next generation technologies.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction of Cell and Bio-Molecules :** Structure and functions of a cell. Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, Proteins, lipids. Importance of special biomolecules: Properties and functions of enzymes, vitamins and hormones.	06	CO1
02	**Analogy of biological organs**	10	CO2

	Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease) Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye) Kidney as a Filtration system (architecture, mechanism of filtration, CKD, dialysis systems). Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine), Heart as a Pumping system Process: (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, stents, pace makers).		
	Self Learning Topic: CPR techniques. Photosynthesis & solar cells, Xylem & plumbing, Thermoregulation in human body & heat transfer in machine, Defense mechanism in organism, signaling processing in biology and electronics.		
03	**Nature Inspired Materials and Mechanism :**	**08**	**CO3**
	Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Biomaterials: Types, properties and applications		
	Self Learning Topic: Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs).		
04	**Biological Inspired Techniques.**	**08**	**CO4**
	Bioprinting techniques and materials, Electrical tongue and electrical nose in food science, Selfhealing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).		
	Self Learning Topic: DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis.		
05	**Bio-Medical Devices**	**04**	**CO5**
	Diagnostic (X-ray machines, CT scanners and MRI machines.) Therapeutic (ventilators, infusion pumps and pacemakers) , Monitoring (Oximeter, Glucometer,Thermometer, BP monitor) **Implantable** devices and Smart Devices		
06	**Bio-Engineering Applications**	**06**	**CO6**
	Bio-medical imaging: Principle, types and examples Biosensors: Principle, types and examples Bioprinting: 3D printing of biological tissues and organ engineering and transplanting		

	Artificial Intelligence in biomedical field		
	Total	**42**	

Text Books:

1. Stuart Fox, Krista Rompolski, "Human Physiology", McGraw-Hill eBook. 16th Edition, 2022
2. Leslie Cromwell, "Biomedical Instrumentation", Prentice Hall 2011.
3. Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., "Biology for Engineers", Tata McGraw-Hill, New Delhi, 2012.
4. Ibrahim Ozbolat, "3D Bioprinting: Fundamentals, Principles and Applications" Academic Press, 2016.
5. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
6. T Johnson, Biology for Engineers, CRC press, 2011 Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.
7. Dr. U. Satyanarayana Dr. U. Chakrapani, "Biochemestry (with Clinical Concepts & Case Studies)", Elsevier 4th Edition, New Delhi 2013.

References:

1. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009
2. Molecular Biology by G. Padmanabhan, K. SivaramSastry, C. Subramanyam, 1995, Mac Millan
3. AlbertsEt.Al. The molecular biology of the cell, 6/e, Garland Science, 2014
4. https://onlinecourses.nptel.ac.in/noc19_ge31/preview
5. VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource
6. https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non biologists
7. https://nptel.ac.in/courses/121106008

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
OE3012	Indian Constitution & Governance	20	20	60	1	2	100	

Prerequisite: Know-how of Indian history and polity	
Course Objectives: The course aims to	
1	To create awareness about Indian Constitution to undergraduate students
2	To give knowledge about the system of government (central and state) and also the fundamental rights and duties enshrined in the Indian Constitution
3	To create awareness about Indian Judiciary, Constitutional Bodies, Regulatory Bodies and Public Policy
4	To give knowledge about important aspects of Governance
Course Outcomes: Learners will be able to	
1	To remember and understand the fundamental Rights and Duties
2	To understand the system of Indian Government
3	To discuss and summarize the Powers and Functions of Central and State Government
4	To explain Indian Judiciary System and Constitutional Bodies
5	To outline the functionalities of various Regulatory Bodies
6	To understand the important aspects of Good Governance

Module	Detailed Contents	Hrs.	CO Mapping
01	**Constitutional Framework** Constitutional law as the Supreme law of land Historical Background of Indian Constitution Making of Indian Constitution Salient Features of the Constitution Preamble of the Constitution Fundamental Rights and Duties Directive Principles of State Policy **Self Learning Topic:** Sources of the Constitution, Comparison of the Constitutions, Government of India Act, 1935	8	CO1
02	**System of Indian Government**	7	

	Parliamentary System Federal System Legislative Relations between the Centre and States Inter-State Relations Emergency Provisions		**CO2**
	Self Learning Topic: Parliament and its Committees		
03	**Central (Union) and State Government**	**7**	**CO3**
	Election, Qualifications, Oath, Powers and Functions of: President and Vice-President Prime Minister State Governor Chief Minister Central and State Council of Ministers		
	Self Learning Topic: Panchayati Raj and Municipalities		
04	**Indian Judiciary and associated Constitutional Bodies**	**8**	**CO4**
	Supreme Court of India State High Court, Sub-ordinate Courts Election Commission of India Comptroller and Auditor General of India Attorney General of India Advocate General of the State		
05	**Regulatory Bodies and Public Policy**	**7**	**CO5**
	Insurance Regulatory and Development Authority (IRDAI) Securities and Exchange Board of India (SEBI) Telecom Regulatory Authority of India (TRAI) Bar Council of India (BCI) All India Council for Technical Education (AICTE) National Policy for Empowerment of Women, National Health Policy National Policy on Skill Development, Education Policy		
	Self Learning Topic: Autonomous and Advisory Bodies		
06	**Important Aspects of Governance**	**5**	**CO6**
	Good Governance, e-Governance Citizen's Charter People's Participation Public Sector Reforms Corporate Governance		
	Total	**42**	

Text Books:

1. Lawman's Bare Act - The Constitution of India, Kamal Publishers, New Delhi.
2. M Laxmikanth, Indian Polity, 5th Edition, McGraw Hill Education
3. M Laxmikanth, Governance in India, 2nd Edition, McGraw Hill Education
4. Durga Das Basu, Introduction to the Constitution of India, 23rd Edition, LexisNexis

References:

1. https://iipa.org.in/upload/polity1.pdf
2. https://iipa.org.in/upload/polity2.pdf
3. https://cdnbbsr.s3waas.gov.in/s380537a945c7aaa788ccfcdf1b99b5d8f/uploads/2024/07/2024071689031 2078.pdf

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
OE3013	Human Psychology	20	20	60	1	2	100	

Prerequisite:	
Course Objectives: The course aims to	
1	Understand the fundamental concepts and theories of human psychology.
2	Analyse cognitive, emotional, and social development across the human lifespan.
3	Evaluate different psychological approaches to behaviour, perception and learning.
4	Apply psychological principles to real-life scenarios, including workplace and interpersonal relationships.
Course Outcomes: Learners will be able to	
1	Identify key psychological concepts and their relevance in daily life.
2	Understand and analyse cognitive functions like memory, perception and problem-solving.
3	Apply psychological theories to interpret human emotions and behaviour.
4	Examine different personality types and their influence on individual behaviour.
5	Evaluate mental health conditions and discuss various therapeutic approaches.
6	Relate psychology to real-world applications in education, workplace and health.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction to Psychology** Definition and scope of psychology, importance in daily life, historical perspectives, Functionalism, Psychoanalysis, Behaviourism, Humanism, Cognitive Psychology.	05	CO1
02	**Human Cognition & Personality** Sensation & perception, stages of memory (sensory, short-term, long-term), forgetting and memory enhancement techniques, intelligence (IQ, emotional intelligence). Theories of personality **Self-Learning Topic:** Memory Enhancement Techniques and their Effectiveness	06	CO2

03	**Emotions & Motivation** Basic emotions and their role in behaviour, Theories of emotion, Intrinsic vs. extrinsic motivation, major motivation theories, application of motivation in workplace and education. **Self-Learning Topic:** Case Study on Emotional Intelligence in Leadership and Workplace Productivity.	**07**	**CO3**
04	**Personality & Behavioural Psychology** Types of personalities, social perception and group behaviour, factors influencing attitude formation, persuasion, leadership styles, social influence (conformity, obedience, compliance), communication and its impact on behaviour. Overview of psychological disorders: Anxiety, Depression, Schizophrenia, OCD. **Self-Learning Topic:** The Role of social media in Shaping Human Behaviour and Perceptions.	**08**	**CO4**
05	**Stress & Well-being** Theories of stress, impact of stress on physical and mental health, coping mechanisms (problem-focused vs. emotion-focused coping), resilience and positive psychology techniques for well-being. **Self-Learning Topic:** Meditation, Mindfulness, and Stress Reduction Techniques – A Practical Guide.	**08**	**CO5**
06	**Applications of Psychology** Role of psychology in workplace settings (Industrial & Organizational Psychology), Human-Computer Interaction, ethical considerations in psychology (confidentiality, informed consent, ethical dilemmas). **Self-Learning Topic:** Psychological Factors Influencing Consumer Behaviour and Marketing Strategies	**08**	**CO6**
	Total	**42**	

Text Books:

1. Psychology, Author: Saundra K. Ciccarelli, J. Noland White, Publisher: Pearson, 6th Edition.
2. Understanding Psychology, Author: Robert S. Feldman, Publisher: McGraw-Hill, 14th Edition.
3. Introduction to Psychology, Author: James W. Kalat, Publisher: Cengage Learning, 11th Edition.

References:

1. https://onlinecourses.nptel.ac.in/noc20_hs28/preview
2. https://www.apa.org/
3. https://positivepsychology.com/

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
OE3014	Disaster Management and Mitigation	20	20	60	1	2	100	

Prerequisite: Require knowledge of Environmental Science concepts	
Course Objectives: The course aims to	
1	Introduce the fundamental concepts of disaster management
2	Understand the causes, impact and risk analysis of various disasters.
3	Familiarise students with disaster mitigation ,preparedness and response strategies
4	Educate about the role of technology, engineering solutions, and policies in disaster risk reduction
5	Enable students to design and implement disaster management strategies in engineering projects.
Course Outcomes: Learners will be able to	
1	Understand the different types of disasters and their effects on the environment and society
2	Analyse disaster risk and vulnerabilities related to engineering systems
3	Understand structural and non-structural mitigation measures
4	Apply disaster preparedness and response strategies in engineering practices
5	Understand use of recent technologies for disaster mitigation
6	Understand policies , Governance and legal framework for disaster management

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction to Disaster management** 1.1 Definition: Disaster, Hazard, Vulnerability, Risk, Direct and Indirect Effects of Disaster 1.2 Types of disasters: Natural (Earthquake, Flood, Cyclone, Drought, Tsunami, Landslides) & Man-Made (Industrial, Chemical, Nuclear, Biological, Fire, Accidents, Terrorism). 1.3 Phases of Disaster Management Cycle (Prevention, Mitigation, Preparedness, Response, Recovery, Rehabilitation). **Self Learning Topic:** List some natural and Man-made disasters that	08	CO1

	happened in India in the last 5 years.		
02	**Module Title: Risk Assessment and Vulnerability Analysis** 2.1 Hazard Identification and Risk Assessment (HIRA) with objectives, key components, Steps, tools and techniques used. 2.2 Vulnerability and Capacity Assessment (VCA): components and process. 2.3 Disaster Risk Reduction (DRR): Concepts and Approaches 2.4 Community-Based Disaster Risk Reduction (CBDRR): Principles and Key components.	**07**	**CO2**
03	**Disaster Mitigation measures.** 3.1 Structural Mitigation Measures: Earthquake-resistant structures, Cyclone shelters, Flood embankments, Landslide control structures 3.2 Non-Structural Mitigation Measures: Early Warning Systems, Public Awareness and Education, Insurance and Financial Mitigation.	**06**	**CO3**
04	**Disaster Preparedness and Response** 4.1 Preparedness Planning, Incident Command System (ICS), Emergency Operations Centers (EOC), Search and Rescue (SAR) operations, Relief and Rehabilitation measures 4.2 Logistics and Supply Chain in Disaster Management. 4.3 Role of Government, NGOs, Armed Forces, and International Agencies. 4.4 Do's and Don'ts in case of Disaster .	**07**	**CO4**
05	**Applications of Technology in Disaster Management** 5.1 Remote Sensing and GIS Applications. 5.2 Role of Internet and softwares for effective disaster management. 5.3 ICT and Communication Technologies. 5.4 Drones and Unmanned Systems 5.5 Case studies of Technological Interventions. **Self Learning Topic:** Roles of Engineers in disaster management and mitigation with examples.	**07**	**CO5**
06	**Policies,Governance and Legal Framework** 6.1 Paradigm shift in Disaster Management. 6.2 Disaster Management Act, 2005 (India) / Relevant National Acts. 6.3 National Institute of Disaster Management (NIDM), National Disaster Management Authority (NDMA) and State DMAs 6.4 International Frameworks: Sendai Framework, SDGs, Role of Policies in Engineering Practices. 6.5 Case studies on successful Disaster Management strategies.	**07**	**CO6**
	Total	**42**	

Text Books:

1. "Disaster Management" by Harsh K. Gupta
2. "Introduction to International Disaster Management" by Damon P. Coppola
3. "Disaster Management and Preparedness" by Collins Larry M. and Schneid Thomas D.

4. “Disaster Management and Mitigation”, by B.K. Khanna, New India Publishing Agency.
5. “An Introduction to Disaster Management: Principles and Practice”, by Satish Modh.
6. Natural Hazards and Disaster Management, Vulnerability & Mitigation by R B Singh, Rawat Publications.

References:

1. National Disaster Management Authority (NDMA), India: Guidelines on Earthquakes, Floods, Cyclones, Industrial Disasters, Urban Flooding, etc. Available at: https://ndma.gov.in IS Codes for Earthquake Resistant Design (IS 1893, IS 13920).
2. United Nations Office for Disaster Risk Reduction (UNDRR).
3. UNISDR Guidelines and Sendai Framework Documents

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignments/ Case studies: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
EEMC301	Entrepreneurship & Financial Management	20	20	60	1	2	100	

Course Objectives: The course aims to	
1	Introduce students to the concepts of entrepreneurship and help them to identify entrepreneurial opportunities.
2	Provide a brief overview of business planning and funding options.
3	Understand the basic concepts of time value of money, returns and risks, working capital and sources of finance.
4	To provide overview of capital budgeting, capital structure, dividend policy
Course Outcomes: Learners will be able to	
1	Understand the concept of fundamental entrepreneurship, develop an entrepreneurial mindset, and recognize the relevance of entrepreneurship across various industries.
2	Identify and evaluate entrepreneurial opportunities through systematic market research and develop a comprehensive and viable business plan for a startup.
3	Describe the essential aspects of funding and understand various sources of finance
4	Apply the principles of capital structure to effectively strategize funding for startups.
5	Analyse the concept of capital budgeting and working capital management
6	Evaluate investment, financing, and dividend decisions to optimize business performance and sustainability.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Foundations of Entrepreneurship**	04	CO1
	Understanding entrepreneurship: Definition, scope, and significance, Key characteristics of successful entrepreneurs, **Exploring entrepreneurial ecosystems:** Components and impact, **Developing an entrepreneurial mindset:** Creativity, risk-taking, and resilience, The role of entrepreneurship across industries		
	Self-Learning Topic: Case study on successful entrepreneurs.		
	Evaluating Entrepreneurship Opportunities		

02	Assessing entrepreneurial opportunities, Market research and feasibility studies, Lean startup methodologies, Elements of business plan, Strategic marketing and sales approaches	**04**	**CO2**
	Self-Learning Topic: Understanding the procedure and types of permissions to initiate the startups.		
03	**Fundamentals of Funding and Finance**	**04**	**CO3**
	Time value of money, return and risk, Stages of financing, Debt, venture capital and other forms of financing, Sources of startup funding, Introduction to venture capital and angel investors, Crowdfunding and bootstrapping overview		
04	**Capital Structure**	**05**	**CO4**
	Determinants of capital structure: Key factors influencing an entity's financial structure, **Theories and models of capital structure:** Analyzing various conceptual approaches, **Traditional and modern theories:** Net Income (NI) Approach, Net Operating Income (NOI) Approach		
05	**Capital Budgeting and Working Capital Management**	**06**	**CO5**
	Introduction to capital budgeting: Meaning and importance of capital budgeting, Key Inputs for capital budgeting decisions, **Working capital management:** Meaning and concept of working capital, Importance of working capital management, **Investment appraisal techniques:** Accounting rate of return (ARR), Payback period & discounted payback period, Net present value (NPV), Profitability index (PI), Internal rate of return (IRR).		
06	**Dividend Policy**	**05**	**CO6**
	Introduction to dividend policy: Meaning and significance of dividend policy in financial management, **Determinants of dividend decisions:** Key factors influencing an entity's dividend policy, **Overview of dividend policy theories and approaches:** Walter's Model- Relationship between dividend decisions and firm valuation, Gordon's Model- Dividend relevance and its impact on stock prices		
	Total	**28**	

Text Books:

1. Entrepreneurship: A Real -World Approach by Rhonda Abrams.
2. Entrepreneurship- Theory, Process Practice –by Kuratko &Hodgetts, Thompson South- Western Publication.
3. Alexander Osterwalder and Yves Pigneur, "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers".
4. Indian Financial System, 9" Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education, New Delhi.
5. Financial Management, 11h Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) & Company Limited, New Delhi.

References:

1. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" by Eric Ries.
2. Fundamentals of CORPORATE FINANCE, S. A. Ross, R. W. Westerfield, and B. D. Jordan (11th ed.), McGraw Hill, 2018.
3. https://onlinecourses.nptel.ac.in/noc25_ge11/preview
4. https://nptel.ac.in/courses/127105007
5. https://onlinecourses.nptel.ac.in/noc21_mg93/preview

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40% to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment/Case study: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
VEC301	Environment & Sustainability	NA	50	NA	NA	NA	50	

Prerequisite: Knowledge of Universal human values & geography	
Course Objectives: The course aims to	
1	To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
2	Understand and identify environmental issues relevant to India and global concerns
3	To familiarize the concept of sustainable development goals
4	Familiarize environment related legislations
Course Outcomes: Learners will be able to	
1	Demonstrate an understanding of the basic concepts of the environment, ecosystems, and biodiversity
2	Identify and understand the Global Environmental concerns.
3	Learn & understand the concepts of Biodiversity.
4	Learn & understand the implementation of Environment Management.
5	Understand and apply the concept of Sustainable Development Goals (SDGs) in addressing environmental and socio-economic issues.
6	To Gain knowledge of environment related legislations.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction and Definition of Environment**:	06	CO1
	Significance of Environment Management for contemporary managers, Environmental issues relevant to India, The Energy scenario		
	Self-Learning Topic: Content of Environment		
02	**Module Title: Global Environmental concerns.**	05	CO2
	Global warming-causes, effect, process, Greenhouse effect , Acid Rain, Ozone Depletion, Hazardous Wastes, Energy resources, Endangered life-species, Loss of Biodiversity . Emerging technologies to address Global warming		

	Self-Learning Topic: Various types of Pollutions		
03	**Module Title: Biodiversity**: Ecosystems and interdependence between living organisms, habitats, limiting factors, Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation , hot-spots of biodiversity , threats to biodiversity	**04**	**CO3**
04	**Module Title: Implementation of Environment Management:** Role and functions of Government as a planning and regulating agency, NGO, Corporate Environmental practices, AI driven environmental management.	**05**	**CO4**
05	**Module Title: Sustainability Practices & Management:** Sustainable practices, Environmental impact assessment, impact analysis, Environmental life cycle analysis, Environmental risk assessment, ecological Sustainable development, Principles of sustainable development, sustainable development goals, economic development & Environment ,green growth, AI and Sustainability practices.	**05**	**CO5**
06	**Module Title: General overview of major legislations:** Environment Protection Act, Air (P & CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act. **Self-Learning Topic: Indian Constitution**	**03**	**CO6**
	Total	**28**	

Text Books:

1. Environmental Management: An Indian Perspective, S N Chary and Vinod Vyasulu, Macmillan India, 2000
2. Environmental Management V Ramachandra and Vijay Kulkarni, TERI Press

.

References:

1. Indian Standard Environmental Management Systems Requirements with Guidance for Use, Bureau Of Indian Standards, February 2005.

Continuous Internal Evaluation (50 Marks)

1. Seminar: 10 Marks
2. Field Visit/ NSS activity as case study: 20 Marks
3. Regularity and attendance: 5 Marks
4. Course project & Report (Group activity) : 15 Marks.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2*+2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
ETVSEC301	C++ and Java Programming	-	25	25	-	-	50	

Prerequisite: VSEC102 - C Programming	
Course Objectives: The course aims to	
1	Describe the basic principles of C++ and JAVA programming
2	Implement the object-oriented concepts such as data abstraction, Encapsulation, inheritance and polymorphism
3	Develop a foundation for advanced programming
4	Experiment the programming insight using C++ and JAVA constructs
Course Outcomes: Learners will be able to	
1	Experiment the basic principles of C++ programming
2	Apply C++ Control structures for effective programming
3	Develop programming applications using Operator Overloading, Inheritance and polymorphism on C++
4	Implement the basic programming in JAVA
5	Analyse the strength of JAVA using Inheritance, Polymorphism, packaging and Encapsulation
6	Illustrate the concept of Utility and applicability of JAVA using Exception Handling and Applets in Java

Module	Detailed Contents	Hrs.	CO Mapping
1	**Introduction to C++**	**4**	
	Need of Object-Oriented Programming (OOPs), Basic concepts of Object-Oriented Programming, C++ programming Basics, Data Types, Structures, Enumerations, control structures, Arrays and Strings, Class, Object, class and data abstraction.		**CO1**

	Self-Learning Topic: Operators-Arithmetic, Relational and logical, Increment-Decrement operators, Conditional operators		
2	**C++ Control Structures**	**4**	
	Branching - If statement, If-else Statement, Decision. **Looping –** while, do-while, for loop **Nested control structure-** Switch statement, Continue statement, Break statement. **Array-** Concepts, Declaration, Definition, Accessing array element, One dimensional and Multidimensional array.		**CO2**
3	**Object-Oriented Programming using C++**	**6**	
	Operator Overloading- concept of overloading, operator overloading, Overloading Unary Operators, Overloading Binary Operators **Function-** Function prototype, accessing function and utility function, Constructors and destructors, Copy Constructor, Objects and Memory requirements, Static Class members, data abstraction and information hiding, inline function. **Constructor-** Definition, Types of Constructors, Constructor Overloading, Destructor. **Inheritance-** Introduction, Types of Inheritance, Inheritance, Public and Private Inheritance, Multiple Inheritance Visibility. Modes Public, Private, Protected and Friend **Polymorphism-** concept, relationship among objects in inheritance Hierarchy.		**CO3**
4	**Introduction to Java**	**4**	
	Difference between C++ and Java. Java History, Java Features, Java Virtual Machine, Data Types and Size, Programming Language JDK Environment and Tools.		**CO4**
5	**Inheritance, Polymorphism, Encapsulation using Java**	**6**	
	Classes and Methods: class fundamentals, declaring objects, assigning object reference variables, adding methods to a class, returning a value, constructors. **Inheritances:** Member access and inheritance, super class references, multilevel hierarchy, constructor call sequence, method overriding. **Packages and Interfaces:** defining a package, finding and importing packages, interfaces.		**CO5**
6	**Exception Handling and Applets in Java**	**4**	
	Exception Handling: Exception handling using try, catch, finally, throw and throws, Multiple try and catch blocks, user defined exception. Thread lifecycle, thread class methods, creating threads using extends and implements keyword. **Applet:** Applet Fundamental, Simple JAVA Applets programming		**CO6**
	Total	**28**	

Suggested list of Experiments:

Sr. No.	List of Experiments	CO Mapping
	C++ Programs	
1	Print Number Entered by User using C++	CO1
2	Swap Two Numbers using C++	CO1
3	Enter an array using C++	CO2
4	Loop and if- else statement using C++	CO2
5	While loop using C++	CO2
6	Create a class to read and add two distance using C++	CO3
7	Simple Class and Object using C++	CO3
8	Constructor overloading using C++	CO3

9	Inheritance using C++	CO3
10	Create a class for student to get and print details of a student using C++	CO3
	JAVA Program	
1	Display Multiplication table of 15 using while loop using JAVA	CO4
2	Selection Control Statements using JAVA	CO4
3	Iteration Control Statements using JAVA	CO4
4	Display sum of first 10 even numbers using do-while loop using JAVA	CO4
5	Study of an Arrays using JAVA	CO5
6	Inheritance using JAVA	CO5
7	Demonstrate Parameterized Constructor using JAVA	CO5
8	Interface using JAVA	CO6
9	Multithreading using JAVA	CO5
10	Applet using JAVA	CO6

Continuous Internal Evaluation (25 Marks)

1. Lab Performance: 10 Marks
2. In-Semester Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks

Laboratory plan:

At least **10** experiments (**5 experiments** each on **C++** and **JAVA**) covering entire syllabus should be set to have well predefined inference and conclusion.

Textbooks:

1. Bjarne Stroustrup, "The C++ Programming language", Third edition, Pearson Education.
2. Yashwant Kanitkar, "Let Us Java", 2nd Edition, BPB Publications.
3. D.T. Editorial Services, "Java 8 Programming Black Book", Dreamtech Press, Edition: 2015
4. Deitel, "C++ How to Program", 4th Edition, Pearson Education.

References:

1. Herbert Schidt, "The Complete Reference", Tata McGraw-Hill Publishing Company Limited, Ninth Edition.
2. Java: How to Program, 8/e, Dietal, PHI.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Languageser Guide", Pearson Education.
4. Sachin Malhotra, Saurabh Chaudhary "Programming in Java", Oxford University Press, 2010.
5. https://onlinecourses.nptel.ac.in/noc20_cs07/preview
6. https://archive.nptel.ac.in/courses/106/105/106105191/
7. https://www.w3schools.com/cpp/default.asp
8. https://www.w3schools.com/java/default.asp

Oral & Practical Exam (25 Marks)

An Oral & Practical exam will be held based on entire syllabus.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
ETPCL301	Digital System Design Lab		25	25	-	-	50	

Prerequisite:	
Course Objectives: The course aims	
1	To get familiarise with basic building blocks of Digital System Design and verify the operation of various digital ICs.
2	To understand and implement digital circuits for code conversion.
3	To train students to design and implement combinational and sequential circuits.
4	To understand digital logic simulation using the EDA tool.
Course Outcomes: Learners will be able to	
1	Identify various Digital ICs which are basic building blocks of digital system design and verify the operation of digital ICs.
2	Evaluate the code conversions from one system to another system.
3	Design and implement combinational circuits like adder, subtractor, multiplexer, code converters etc.
4	Identify and understand the working of various types of flip flops.
5	Design and implement basic sequential circuits such as counters.
6	Develop and simulate VHDL architectural representations of digital systems and components using structural, behavioural or data flow concept.

Suggested List of Experiments

Sr. No.	List of Experiments	CO Mapping
01	To verify the logic gates using digital ICs	CO1
02	To evaluate G to B and B to G conversion	CO2
03	To evaluate BCD to excess 3 code conversion	CO2
04	To verify D -Morgans Theorem	CO2
05	To study half / Full adder and subtracter	CO3

06	To study 4:1 MUX and 1:4 Demux	CO3
07	To study operation of SR and JK flip flop	CO4
08	To study operation of D and T flip flop	CO4
09	To study 4-bit synchronous binary up and down counter	CO5
10	To study 4 bit asynchronous binary up and down counter	CO5
11	Design and execute full adder circuits and verify it using VHDL test bench	CO6
12	Design and execute 4:1 MUX circuits and verify it using VHDL test bench	CO6
13	Design and execute 1:4 DEMUX circuits and verify it using VHDL test bench	CO6
14	Design and execute RS flip flop circuits and verify it using VHDL test bench	CO6
15	Design and execute JK flip flop circuits and verify it using VHDL test bench	CO6

Continuous Internal Evaluation (25 Marks)

1. Lab Performance: 10 Marks
2. In-Semester Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks

Laboratory plan:

Perform at least 10 Experiments and one mini project in group of 4 students covering entire syllabus must be given during the “Laboratory session batch wise”.

Oral & Practical Exam (25 Marks)
An Oral & Practical exam will be held based on entire syllabus.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester III

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					
ETPCL302	**Electronic Devices & Integrated Circuits Lab**	-	25	25	-	-	50	1

Prerequisite: Component testing and identification.	
Course Objectives: The course aims to	
1	Identify different components, equipments and measuring instruments used to perform Electronics Devices and Circuits laboratory work.
2	Provide hands on experience to develop laboratory setup for performing given experimental using various equipment, electronic devices and measuring instruments.
3	Create an ability among students to gather appropriate data and analyse the same to relate theory with practical
4	Develop trouble shooting abilities among students.
Course Outcomes: Learners will be able to	
1	Know various equipment, electronics devices and components, and measuring instruments used to perform laboratory work
2	Examine performance of various biasing circuit.
3	Demonstrateand comaper theory in practical of differential ampifier using simulator/VLAB
4	Observed performance of different waveform generator circuits.
5	Develop trouble shooting abilities while performing hardware experiment on breadboard.
6	Prepare laboratory report(Journal) to summaries the outcome each experiment.

Suggested List of Experiments

Sr. No.	List of Experiments	CO Mapping
1.	To study testing of different electronics components and IC	CO1,CO6,CO5
2.	Describe pn junction diode characteristics.	CO2.CO6,CO5
3.	Evalute performance of BJT biasing circuits.	CO2.CO6,CO5
4.	Observe characteristics of CE configuration.	CO2.CO6,CO5

5.	Evalute performance of JFET biasing circuits.	CO2.CO6,CO5
6.	Evalute performance of BJT as CE amplifier.	CO2.CO6,CO5
7.	Simulation experiment on study of CS amplifier using Vlab/LT SPICE	CO2.CO6,CO5
8.	Justify working of differential amplifier.	CO3.CO6,CO5
9.	Compare inverting, non-inverting amplifier using IC 741.	CO3.CO6,CO5
10.	Demonstrate wien bridge Oscillator to generate sine wave	CO4.CO6,CO5
11.	Demonstrate RC phase shift Oscillator to generate sine wave	CO4.CO6,CO5
12.	Examine performance of Integrator	CO3.CO6,CO5
13.	Examine performance of Differentiator	CO3.CO6,CO5
14.	Discuss Schmitt trigger to generate squar wave using Op-amp.	CO4.CO6,CO5
15.	Complete Hardware and Simulation miniproject on multistage amplifier circuit or any application of different special ICs	all CO'S

Continuous Internal Evaluation (25 Marks)

1. Lab Performance: 10 Marks
2. In-Semester Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks

Laboratory plan:

At least 10 Experiments including not more than 02 simulations. One mini project in group of 4 students

Oral & Practical Exam (25 Marks)

An Oral & Practical exam will be held based on entire syllabus.

Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ETPCC401	**Mathematics for Random Signal Analysis**	20	20	60	1	2	100	

Prerequisite: ETESC301- Mathematics for Signals and Systems	
Course Objectives: The course aims to	
1	Describe the concept of set theory and probability
2	Differentiate continuous and discrete random variables
3	Explain the behaviour of one dimensional and two-dimensional random variables
4	Examine the problem-solving skills
Course Outcomes: Learners will be able to	
1	Describe the concept of Set theory and basic concepts in Probability
2	Summarize continuous random variables, their distributions and moments
3	Differentiate Discrete Random Variable and Continuous Random Variable and discuss the Discrete random variable in detail
4	Analyse mean, variance, and distribution function of random variables and functions of random variables.
5	Define the Multiple Random Variables, Convergence, covariance, correlation and central limit theorem
6	Apply linear regression algorithms for predictive analytics

Module	Detailed Contents	Hrs.	CO Mapping
01	**Concept of Set theory and basic concepts in Probability** Representation of Sets, Types of sets, Definitions of probability, joint, conditional, and total probability, Bayes' theorem, independence of events, binary symmetric communication channel analysis using Bayes' theorem. **Self-Learning Topic:** Cardinality of Sets, Venn Diagrams, De Morgan's Laws	**5**	**CO1**

02	**Introduction to Continuous Random Variables** Definition of Continuous Random Variable, Probability Density Function (pdf) and properties, Cumulative Distribution Function (CDF) and properties, Types of Continuous Random Variables: Uniform Distribution, Normal Distribution, Exponential Distribution, Mean, variance and moments of Continuous Random Variable	**8**	**CO2**
03	**Introduction to Discrete Random Variables** Definition of Discrete Random Variable, probability mass function (PMF) and properties, Cumulative Distribution Function (CDF) and properties, Types of Discrete Random Variables: Binomial, Poisson, Uniform, Gaussian and Rayleigh, Mean, variance and moments of Discrete Random Variable, Difference Between Discrete Random Variable and Continuous Random Variable	**8**	**CO3**
04	**Operations on One Random Variable** Function of a random variable and their distribution and density functions. Expectation, variance, moments, Moment Generating function, characteristic function of random variable. Transformation of a random variable, Markov and Chebyshev inequality, characteristic functions, moment theorem.	**8**	**CO4**
05	**Multiple Random Variables and Convergence** Pairs of random variables, joint CDF and joint PDF. One function of two random variables; joint moments, covariance and correlation- independent, uncorrelated and orthogonal random variables. Central limit theorem and its significance	**7**	**CO5**
06	**Introduction to Statistical Learning and Applications** Regression and model building, simple linear regression, multiple linear regression, least square estimation of the coefficients, residual calculations. Applications of simple linear regression in prediction of new observations.	**6**	**CO6**
	Total	**42**	

Text Books:

1. T. Veerarajan, "Probability, Statistics and Random Process", Tata McGraw Hill Education, Third Edition (2018).
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables, and Stochastic Processes", Tata McGraw Hill Education
3. Henry Stark & John Woods, "Probability, Statistics, and Random Processes for Engineers, 4th Edition, Pearson Education, 2012
4. Douglas C. Montgomery, Elizabeth A. Peck and G. Geoffrey Vining, "Introduction to linear regression Analysis", student edition, Wiley publications.

References:

1. Scott Miller and Donald Childers, "Probability and Random Processes with Applications to Signal Processing and Communications", Elsevier Publication.
2. Hwei Hsu, "Theory and Problems of Probability, Random Variables, and Random Processes", Schaum's Outline Series, McGraw Hill, 1997.
3. P. Ramesh Babu, "Probability Theory and Random Process", Tata McGraw Hill Education.
4. Introduction to probability and Statistics, Prof. G. Srinivasan (IIT Madras); https://onlinecourses.nptel.ac.in/noc21_ma01/preview
5. Probability and Probability Distributions By Dr P.Nagesh: https://onlinecourses.swayam2.ac.in/cec21_ma02/previw

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

8. Assignment: 5 Marks
9. Quiz/Open book test/Presentation: 10 Marks
10. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ETPCC402	Analog and Digital communication	20	20	60	1	2	100	

Prerequisite: 1)ETPCC302(Electronics devices and Integrated circuits) 2)PCL2012(Elements of Telecommunication)	
Course Objectives: The course aims to	
1	Examine the impact of noise and distortions in communication systems.
2	Demonstrate the fundamental concepts of Analog and Digital Communication Systems..
3	Evaluate the performance of various error control codes.
4	Illustrate various source and channel coding techniques
Course Outcomes: Learners will be able to	
1	Define the fundamental concepts of Analog and Digital Communication.
2	Analyse the various Analog Modulation and Demodulation Techniques.
3	Describe various pulse Modulation technique Techniques and understand the concept of Multiplexing Techniques.
4	Apply the concepts of information theory of source coding and channel coding techniques.
5	Evaluate the performance of various error control codes.
6	Describe various digital Modulation and Demodulation Techniques

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction** Block diagram of Analog and Digital Communication System, Signal-to-noise ratio, Noise factor, Noise Figure, Noise Temperature. Friis Formula.Information content of a source symbol.Measure of information.Receiver and its characteristics **Self Learning Topic:** Types of Noise and Electromagnetic Spectrum,Receiver performance	04	CO1
02	**Analog Modulation**	09	

	Amplitude Modulation and Demodulation- Mathematical and Graphical Representation AM wave, Voltage distribution and Power Calculations. Basic Concepts of DSBSC and SSB and VSB. AM Diode Detectors - (Simple and Practical). **Frequency Modulation and Demodulation** -Mathematical Representation of FM wave, deviation ratio, bandwidth requirement, Narrowband and Wideband FM, Pre-emphasis and De-emphasis, Noise-triangle, FM Generation(Varactor Diode and Armstrong method) , FM Detectors- Foster-Seeley Detector		**CO2**
	Self-learning Topics: Use of AM and FM in Modern Communication Technology. Challenges faced by radio broadcasting industry.		
03	**Pulse code Modulation**	**06**	**CO3**
	Sampling Theorem, Nyquist Criteria, Sampling Techniques, Aliasing error and Aperture effect Generation and Detection of PAM, PWM and PPM.Basics of PCM and differential PCM system. concept of DM and ADM Need of Multiplexing, Block Diagram explanation of TDM and FDM Systems.		
	Self Learning Topic: Types of samapling,Application of multiplexing.		
	Source coding and channel coding technique		
04	Basics of Information Theory, Entropy, Shannon Hartley theorem Source Coding Techniques: Huffman coding and Shannon-Fano coding.Error control system and error detection codes:simple parity check codes VRC	**08**	**CO4**
	Self-learning Topics: Applications of Source Coding and Channel Coding Techniques.		
05	**Base band transmission and reception**	**07**	**CO5**
	Block diagram of baseband Transmitter-Receiver system, Need of line codes, Properties, Types of line codes - RZ and NRZ Unipolar formats, RZ and NRZ Polar formats, RZ and NRZ Bipolar format (AMI format), Split phase Manchester format and Polar Quaternary formats. Inter Symbol Interference,EYE pattern.		
	Self Learning Topic: Inter channel Interference		
06	**Digital Modulation**	**08**	**CO6**
	Generation, Detection, Error probability and Bandwidth and power spectra of the following modulations: BASK, BFSK, BPSK, QPSK, offset QPSK, M-ary PSK, and MSK.		
	Self Learning Topic:16QPSK		
	Total	**42**	

Text Books:

1. Kennedy and Davis “Electronics Communication System”, Tata McGraw Hill
2. Wayne Tomasi, “Electronics Communication Systems” Pearson Education, 5th Edition.
3. Herbert Taub, Donald L Schilling, Goutam Saha, “Principles of Communication Systems”, Tata McGraw Hill, 3rd Edition.

References:

1. Simon Haykin, “Communication System”, John Wiley and Sons,4th Ed.
2. B P Lathi, Zhi Ding, Modern Digital and Analog Communication Systems, Oxford University. 4th Ed.
3. Beharouz A. Forouzan, “Data Communication and Networking”, fourth edition.
4. https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ETPCC403	**Microcontroller**	20	20	60	1	2	100	

Prerequisite:ETPCC301(Digital System Design)	
Course Objectives: The course aims to	
1	To acquire a comprehensive understanding of the essential components and systems that constitutes microcomputers & memory systems.
2	To understand the architecture, pin configuration and instructions of 8051 microcontrollers. Comparison between Microprocessor and Microcontroller.
3	To apply the knowledge of 8051 I/O ports, Timer/Counter, Interrupts, serial port (UART) and write the programs related to same.
4	To understand the concepts of advanced microcontroller ARM7 ATMEGA 328, LPC 2148, MSP 430 and STM 32 Microcontrollers, and apply those concepts in the design of embedded systems.
Course Outcomes: Learners will be able to	
1	Understand of the fundamental components and systems integral to microcomputers systems.
2	Understand memory system, the architecture, pin configuration, and instructions of 8051 microcontrollers.
3	Apply the concepts of I/O ports, Timer/Counter, Interrupts, serial port for 8051 microcontroller programming.
4	Understand the ARM7 microcontroller Data flow model, operating modes, instruction set and its suitability for embedded systems and real-time applications.
5	Understand the concepts of advanced microcontroller ARM7 ATMEGA 328, LPC 2148, MSP 430 and STM 32 Microcontrollers, and apply those concepts in the design of embedded systems.
6	Apply the concept of embedded systems and recent advancements in microcontroller technologies and explore their impact on modern applications.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Overview of Microprocessor based computer System** Introduction to the basic components of microcomputers, Significance of signal lines of memory. The actions performed by the microprocessor to fetch and execute instructions from memory	**5**	**CO1**

	after RESET. Concept of RISC & CISC Architecture. Harvard & Von Neumann Architecture. **Self Learning Topic:** Comparative study of different Microprocessor based computer System like 8085/8086/Pentium		
02	**The Memory Systems & introduction to 8051 microcontroller** Concepts of primary memory and secondary memory Need of Secondary memory. Types of Semiconductor Memory, Features of SRAM and DRAM. Cache Memory and its need. Concept of virtual memory, Segmentation and Paging. Comparison between Microprocessor and Microcontroller. Features, architecture and pin configuration of 8051 8bit microcontroller.	**5**	**CO2**
03	**8051 Microcontroller & Assembly Language Programming** CPU timing and machine cycle. Memory organization. Addressing modes. Instruction set. Need of Assembler & Compiler, Assembler Directives, and Programs related to: arithmetic, logical operations.	**8**	**CO3**
04	**8051 I/O Ports, Timer/Counters, Interrupts, Serial Port (UART) communication & Interfacing.** 8051 Input / Output ports and Port structure. 8051 Timer/Counter, Timer modes. 8051 Interrupt 8051 serial communication & modes. Assembly language program related to: delay subroutine, input & output port, timer, counter, serial port and Interrupt. Interfacing LEDs, Relay and switches. Introduction and Features & Data flow model, operating modes of ARM 7	**9**	**CO4**
05	**Advance microcontrollers ARM 7** Architectural inheritance, Pipelining, Programmer's Model, Brief introduction of exception and interrupt handling. Concept of cortex A, cortex R and Cortex M. Instruction Set, Data processing, Data Transfer, Control flow. Compare features of advance microcontrollers ATMEGA 328, LPC 2148, MSP 430, PIC and STM 32 Microcontrollers.	**9**	**CO5**
06	**Study microcontroller Applications** Definition of Embedded System, Embedded Systems Vs General Computing Systems. Factors to be Considered in Selecting a Microcontroller for an Application. Understanding features of ATMEGA 328, LPC 2148, MSP 430 and STM 32 Microcontrollers. Case Study on microcontroller based applications.	**6**	**CO6**
	Total	**42**	

Text Books:

1. M. A. Mazidi, J. G. Mazidi and R. D. Mckinlay, "The 8051 Microcontroller & Embedded systems", Pearson Publications, Second Edition 2006.
2. C. Kenneth J. Ayala and D. V. Gadre, "The 8051 Microcontroller & Embedded system using assembly & 'C' ", Cengage Learning, Edition 2010
3. Steve Furber, "ARM System on chip Architecture", Pearson, 2nd edition
4. Raj Kamal, "Microcontrollers" Architecture, Programming, Interfacing and System Design", Pearson Education India, Second Edition 2011

References:

1. “MCS@51 Microcontroller, Family User’s Manual” Intel
2. The 8051 Microcontroller and Embedded Systems, “Manish K Patel”, McGraw Hill 2014
3. Andrew N. Sloss, Dominic Symes, Chris Wright, “ARM System Developer's Guide: Designing and Optimizing System Software", Elsevier
4. ATmega328P 8-bit AVR Microcontroller with 32K Bytes In-System Programmable Flash datasheet, Atmel
5. Microprocessors and Microcontrollers By Prof. Santanu Chattopadhyay (IIT Kharagpur)
6. https://swayam.gov.in/nd1_noc20_ee42/preview

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

4. Assignment: 5 Marks
5. Quiz/Open book test/Presentation: 10 Marks
6. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs.)		Total Marks	2 Hrs.
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
OE4011	Human Resource Management	20	20	60	1	2	100	

Prerequisite: Knowledge in Business Fundamentals.	
Course Objectives: The course aims to	
1	Develop an understanding of the fundamental concepts, functions and process of Human Resource Management.
2	Obtain the knowledge related to the nature and scope of organizational behaviour and its relevance in Organizational Management.
3	Understand the importance and process of Human resource planning and its applications.
4	Familiarize with various selection procedures and practices related to recruitment, selection and training.
5	Analyze the role of AI and similar technological trends in HR in the digital world.
Course Outcomes: Learners will be able to	
1	Understand the concepts, functions and process of Human Resource Management.
2	Acquire knowledge related to the nature and scope of organizational behavior.
3	Compare and classify concepts of Human resource planning and its applications.
4	Differentiate between various selection procedures and practices related to recruitment, selection and training.
5	Assess the role of AI and similar technological trends in HR in the digital world.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction to Human Resource Management (HRM)** Introduction and Significance of Human Resource Management, Definition, Scope, Features, Importance and Evolution of the concept of HRM, Functions and Objectives of HRM, Principles of HRM, Limitation of HRM, Role and Quality of Human Resource Managers, Need for HRM Approach.	04	CO1
02	**Organizational Behaviour (OB)** Introduction and Origin of Organizational Behaviour, Nature, Scope and its relevance to Organizational Effectiveness, Understanding employee behavior, Meaning and Determinants of Personality, Personality Development, Personality	06	CO2

	Types and assessment of Personality Traits ,Attitude and Behaviour, Group Behaviour , Team Effectiveness, Motivation and Theories of Motivation ,Leadership. **Self-Learning Topic:** Case studies on topics related to Group behaviour, Motivational Theories.		
03	**Human Resource Planning (HRP)** Concept and Objective of Human Resource Planning, Importance and Process of Human Resource Planning, Challenges and Factors affecting HRP ,Steps and Effective HRP, Job Analysis, Job Description and Job Specification, Role Analysis. **Self-Learning Topic:** Study and comparison of various Job Descriptions in an organization.	**06**	**CO3**
04	**Recruitment ,Selection, Performance Management ,Training and Development** **Recruitment:** Definition, Recruitment policy, Constraints and Challenges of Recruitment, sources and methods of Recruitment, New Approaches to recruitment. **Selection:** Selection and its Process,Developing effective selection methods including different types of Tests, Interviews and assessments,Induction and Orientation. **Performance Management :** Internal Mobility, Compensation Management, Fixing of wages, Legislation and objectives of performance appraisal , Learning performance appraisal methods, Understanding the concepts of feedback and coaching, Wages and Benefits, Labour Laws. **Training and Development:** Objectives, Need, Importance of Training, Training Vs. Development, Systematic Approach to Training, Training Methods, Career Planning, Career Development. **Self-Learning Topic:** Recent Trends in Recruitment	**07**	**CO4**
05	**Emerging Trends in HR** The evolving role of HR in a digital world , The rise of Remote/Hybrid work, Employee engagement strategies,AI in HR, Data analytics in HRM . **Self-Learning Topic:** International HRM	**05**	**CO5**
	Total	**28**	

Text Books:

1 K. Aswathappa, “Human Resource Management: Text and Cases”, McGraw-Hill Publication.

2 Laurie Mullins, “Management & Organizational Behavior”, Pearson Publication.

3 B.P.Singh, “Human Resource Management: Concepts and Practices”, Excel Books Publication.

4 Deepa Gupta,M.Gupta,Karth Gupta, “HR Analytics:The Future of HR”,PHI Learning

References:

1 Raymond Noe, John Hollenbeck, Barry Gerhart, Patrick Wright, “Fundamentals of Human Resource Management”, McGraw-Hill Publication.

2 Venkata Ratnam C. S. & Srivastava B. K., “Personnel Management and Human Resources”, Tata McGraw Hill, New Delhi.

3 P. C. Tripathi, "Personnel and Human Resource Management”, S. Chand & Sons Publication.

Assessments :

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Case Study : 5 Marks
2. Group Activity / Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
OE4012	Corporate and Cyber Laws	20	20	60	1	2	100	

Prerequisite: Basic Legal Awareness	
Course Objectives: The course aims to	
1	Provide fundamental knowledge of corporate laws
2	Analyse the legal and regulatory framework governing corporate transactions
3	Explore the fundamentals of cyber law and cybersecurity,
4	Examine emerging trends in corporate and cyber laws
Course Outcomes: Learners will be able to	
1	Understand corporate law fundamentals, business entity structures, and corporate governance.
2	Understand legal provisions of the Companies Act, SEBI regulations, CSR laws, and contract laws.
3	Identify cybercrimes, attack methods, and information security risks.
4	Explain cyber law aspects related to e-commerce, IPR, evidence, and criminal law.
5	Analyse IT Act provisions and cybersecurity compliance standards.
6	Evaluate emerging trends in corporate governance, AI regulation, and digital assets laws.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction to Corporate Laws** Concept, Nature, and Scope of Corporate Laws, Legal Personality of Companies, Types of Business Entities (Private, Public, LLP, Sole Proprietorship), Incorporation and Registration of Companies, Lifting or piercing the corporate Veil, Corporate Governance and Ethics. **Self Learning Topic:** Comparative Study of Corporate Laws Across Countries	05	CO1
02	**Regulatory Framework for Companies**	06	

	Overview of the Companies Act, Key Legal Provisions (Formation, Compliance, Penalties), Shareholder Rights & Director Responsibilities, Company Act 2013 (Key Provisions). Securities and Exchange Laws (SEBI regulations). Corporate Social Responsibility (CSR) Regulations, Contract Law and Business Transactions, Mergers, Acquisitions, and Competition Law		**CO2**
03	**Introduction to Cybercrime** Definition of Cybercrime and information security, Classifications of cybercrime, Planning of Cyber-attacks, Social Engineering, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Identity Theft. **Self Learning Topic:** Botnets, DoS and DDoS Attacks, SQL Injection, Buffer Overflow.	**04**	**CO3**
04	**The Concept of Cyberspace** E-Commerce, The Contract Aspects in Cyber Law, The Security Aspect of Cyber Law, The Intellectual Property Aspect in Cyber Law, The Evidence Aspect in Cyber Law, The Criminal Aspect in Cyber Law, Legal Framework for Electronic Data Interchange Law Relating to Electronic Banking. **Self Learning Topic:** Global Trends in Cyber Law	**05**	**CO4**
05	**Indian IT Act & Information Security Standard compliances** Penalties, Adjudication and Appeals Under the IT Act 2000, IT Act 2008 and its Amendments. Compliance Standards: SOX, HIPAA, ISO, NERC, PCI-DSS, NIST **Self Learning Topic:** GLBA, FISMA	**05**	**CO5**
06	**Emerging Trends in Corporate and Cyber Laws** Environmental, Social, and Governance Compliance, Digital Corporate Governance, Artificial Intelligence (AI) Regulation, Digital Assets and Cryptocurrency Regulations	**03**	**CO6**
	Total	**28**	

Text Books:

1. "Company Law" by Avtar Singh, Eastern Book Company
2. "Indian Corporate Law" by N.D. Kapoor, Sultan Chand & Sons
3. "Business Law Including Company Law" by S.S. Gulshan and G.K. Kapoor
4. Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, New Delhi
5. "Cyber Security & Cyber Laws" by Nilakshi Jain & Ramesh Menon.

References/Online Resources:

1. The Information technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
2. Cyber Law Emerging Trends and Challenges, Dr. Aditya Tomer, Dr. Harshita Singh & Ms. Garima Wadhwa, Redshine Publication
3. https://www.geeksforgeeks.org/corporate-law/

4. https://www.geeksforgeeks.org/cyber-laws-in-india/

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

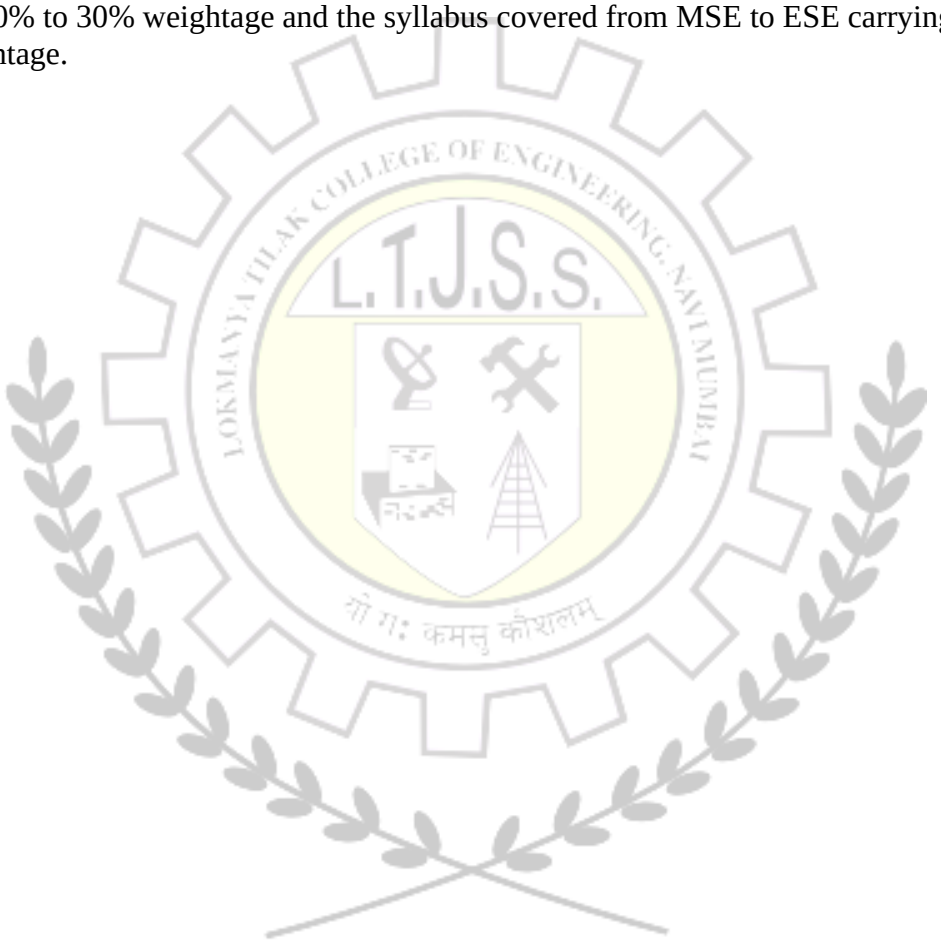
Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.



Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
OE4013	Stock Market & Personal Finance	20	20	60	1	2	100	

Prerequisite: Statistical calculations	
Course Objectives: The course aims to	
1	Explain students with knowledge of Securities Market
2	Impart the students to understand the legal frame work of securities Market
3	Empowers the students to have depth knowledge in different segment of stock exchange
4	Build long term personal finance portfolio
Course Outcomes: Learners will be able to	
1	Understand the basic concept of stock market
2	Exercise the Trading on Stock Market
3	Analyze the fundamental and technical aspect of the stock
4	Understand the legal Frame work of Securities Market
5	Calculate the personal financial needs
6	Determine the personal financial goals

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction to Stock Market and Trading** 1.1 Overview of Stock Market: History, evolution, and types of stock markets. 1.2 Trading Basics: Understanding buying and selling (Entry and Exit form stock), bulls and bears, and market trends. 1.3. Investment Goals and Risk Management: Setting investment objectives, risk tolerance, and asset allocation. 1.4. Stock Market Indices and Sectors: Understanding major stock market indices (e.g., Sensex, Nifty 50, S&P 500, Dow Jones) and sectors (e.g., technology, finance). **Self Learning Topic: Stock brokers in India, fees and charges levied on trader**	04	**CO1**

02	**Financial Markets and Instruments** 2.1 Types of Financial Markets: Money market, bond market, commodity market, and foreign exchange market. 2.2. Stock Market Instruments: Stocks, bonds, ETFs, mutual funds, and derivatives (options, futures). 2.3 Market Participants: Understanding the roles of investors, traders, brokers, and market makers. 2.4 Trading psychology- A practical approach **Self Learning Topic: Difference between Investor and trader, Difference between Investment and Saving**	04	**CO2**
03	**Stock Analysis and Selection** 3.1 Introduction to Technical Analysis: Understanding charts, trends, and patterns. 3.2 Chart Types and Patterns: Line charts, bar charts, candlestick charts, and common patterns (e.g., head and shoulders, triangles). 3.3 Trend Analysis and Indicators: Moving averages, relative strength index (RSI), and other technical indicators. 3.4 Charting Tools and Software: Overview of popular charting platforms (e.g., TradingView, MetaTrader). 3.5 Fundamental Analysis- SMA, EMA, MACD, Bollinger bands, 3.6 Stock analysis through Ratios – P/E ratio, P/B ratio, ROE, EPS, Debt-to-capital ratio, Interest coverage ratio (ICR), Enterprise value to EBIT, Operating margin, Quick ratio **Self Learning Topic: Find the long term stocks, short term stocks in current scenario of market and Explain Why to invest in these stocks.**	06	**CO3**
04	**Stock Market regulations** 4.1 SEBI Acts - Securities Contracts (Regulation) Act, 1956, Securities and Exchange Board of India Act, 1992, Depositories Act 1996, Securities Laws (Amendment) Act, The Finance Act. 4.2 Role of SEBI, Stock exchanges, Stock brokers and Investors 4.3 Stock market Surveillance – ASM, GSM, ESM, T2T 4.4 Investor protection, Investor education, Investor awareness	04	**CO4**
	Self Learning Topic: Case study of Stock Market Frauds		
05	**Introduction to Personal Finance** 5.1 Need for Personal Finance Management 5.2 Income tax planning 5.3 Assessment of personal risk profile 5.4 Understanding the Salary slips 5.5 Insurance (Need of Insurance, Separating investment from insurance Life Insurance, Term Insurance, Mediclaim, Property) **Self Learning Topic: Learn and Understand the Union Budget, Global Budget**	05	**CO5**

06	**Financial Planning for Engineers** 6.1 Time value of money, Return on Investment, Modes of personal Investment and savings (Gold, bonds, Fixed Deposits, Mutual Funds, Crypto currency, Real estate etc. 6.2 Portfolio building (Personal portfolio components, Self-analysis, Govt and Private Agencies) 6.3 Money management (Engineering Students loan, home loan, credit card, Cash) 6.4 Handling the finance in uncertainty and risk – Pandemic, personal, social, professional life **Self Learning Topic: Build your dream portfolio, make your own balance sheet as an engineering student**	**05**	**CO6**
	Total	**28**	

Reference Books

1. **How the stock market works, M Becket, Kogan Page, 3rd Edition, 2010 (**https://procapital.mohdfaiz.com/books/books-image/mainBook/245114947.pdf **)**
2. **The Intelligent Investor, Benjamin Graham, Perfect Bound, eISBN 0-06-058328-2, June 2003 (**https://sims.sairam.edu.in/wp-content/uploads/sites/7/2024/03/THE-INTELLIGENT-INVESTOR.pdf **)**
3. **How to Make Money in Stocks, William J. O'Neil, 4th edition, 2009 (**https://tradingpsychologist.in/wp-content/uploads/2023/09/How-to-Make-Money-In-Stocks.pdf **)**
4. **Hand Book For Investing & Investor Protection, Dr. Naresh Maheshwari, ICWA New Delhi, January 2011,** https://www.farsightshares.com/wp-content/uploads/2019/05/hand_book.pdf

Web Material

Module	Text Books	References/links
1	**Introduction to Stock Markets, Zerodha**	https://zerodha.com/varsity/modules/
2	Technical Analysis**, Fundamental Analysis, Zerodha**	https://zerodha.com/varsity/module/technical-analysis/
3	**NCFM Technical Analysis Module, NSE limited**	https://zerodha.com/z-connect/wp-content/uploads/2014/06/TA_wrkbk.pdf
4	**Hand Book For Investing & Investor Protection, Dr. Naresh Maheshwari, ICWA New Delhi, January 2011**	https://www.farsightshares.com/wp-content/uploads/2019/05/hand_book.pdf
5	**Financial Education Booklet, SEBI, November 2020**	https://investor.sebi.gov.in/pdf/downloadable-documents/Financial%20Education%20Booklet%20-%20English.pdf
6	**Personal Financial Planning, IDOL, University of Mumbai, May 2023**	https://mu.ac.in/wp-content/uploads/2023/05/M.Com-Sem-IV-Personal-Financial-Planning.pdf

NPTEL and Swayam Links

1. **Financial Markets, Institutions and Financial Services By Prof. Divya Verma | Guru Gobind Singh Indraprastha University, Delhi**
   https://onlinecourses.swayam2.ac.in/cec25_mg11/preview
2. **Financial Institutions and Markets, Dr. Jitendra Mahakud, IIT Kharagpur**
   https://archive.nptel.ac.in/courses/110/105/110105121/

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment/Paper trading/Dummy trading: 5 Marks
2. Quiz/Open book test/Presentation/Trading Demonstration: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
OE4014	**Nutrition Literacy and Health**	20	20	60	1	2	100	

Prerequisite:	
Course Objectives: The course aims to	
1	Understand the fundamentals of nutrition and its role in human health.
2	Learn about energy balance and the principles of diet planning.
3	Analyze the impact of nutrition on lifestyle diseases and their prevention.
4	Gain knowledge about food safety, preservation techniques, and quality control.
5	Explore sustainable nutrition practices and advancements in food technology.
6	Understand dietary recommendations for special conditions and future trends in nutrition.
Course Outcomes: Learners will be able to	
1	Understand the fundamental concepts of nutrition, including macronutrients, micronutrients, and their roles in maintaining health.
2	Analyze energy balance, metabolism, and the principles of diet planning for different age groups and lifestyles.
3	Identify the impact of nutrition on common lifestyle diseases and understand preventive measures through diet and lifestyle modifications.
4	Evaluate food safety standards, food labeling, and regulations to promote healthy food choices.
5	Assess the significance of nutritional requirements during different life stages.
6	Apply nutrition literacy principles to enhance personal well-being and spread awareness about balanced diets and healthy eating habits.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Fundamentals of Nutrition** Introduction to Nutrition: Definition, Importance, and Scope Food Groups and Their Nutritional Value Essential Nutrients: Macronutrients and Micronutrients Water and Dietary Fiber Nutritional Deficiencies: Causes, Symptoms, and Prevention	**5**	**CO1**

02	**Energy Balance and Diet Planning** Energy Metabolism: Basal Metabolic Rate (BMR) and Total Energy Expenditure (TEE) Principles of a Balanced Diet Dietary Guidelines and Food Pyramid Meal Planning for Different Age Groups Special Dietary Considerations: Pregnancy, Lactation, and Vegetarianism	**5**	**CO2**
03	**Nutrition and Lifestyle Diseases** Role of Nutrition in Preventing Lifestyle Diseases Obesity, Diabetes, and Cardiovacular Diseases Hypertension and Osteoporosis Nutritional Management and Intervention Strategies	**4**	**CO3**
04	**Food Safety and Quality** Food Contamination and Foodborne Diseases Food Preservation Techniques Food Adulteration and its Detection Food Safety Standards and Regulations	**4**	**CO4**
05	**Sustainable Nutrition and Food Technology** Sustainable Food Production and Consumption Genetically Modified Foods and Their Impact Functional Foods and Nutraceuticals Role of Technology in Food Science	**5**	**CO5**
06	**Special Diets and Future Trends** Diets for Specific Health Conditions Personalized Nutrition and Nutrigenomics Emerging Trends in Nutrition and Health Future Challenges in Nutrition Science	**5**	**CO6**
	Total	**28**	

Text Books:

1. **Srilakshmi, B.** – *Dietetics*, New Age International Publishers, 8th Edition, 2019.
2. **Srilakshmi, B.** – *Nutrition Science*, New Age International Publishers, 6th Edition, 2021.
3. **Swaminathan, M.** – *Essentials of Food and Nutrition*, Vol. I & II, The Bangalore Printing and Publishing Co. Ltd., 2nd Edition, 2012.
4. **Rao, U.** – *Advanced Human Nutrition*, CBS Publishers & Distributors, 1st Edition, 2014.

References:

1. **Wardlaw, G. M., Smith, A. M.** – *Contemporary Nutrition*, McGraw-Hill Education, 11th Edition, 2018.
2. **Gibney, M.J., Lanham-New, S.A., Cassidy, A., Vorster, H.H.** – *Introduction to Human Nutrition*, Wiley-Blackwell, 2nd Edition, 2013.
3. **Whitney, E., Rolfes, S.R.** – *Understanding Nutrition*, Cengage Learning, 15th Edition, 2018.
4. **Bamji, M. S., Krishnaswamy, K., Brahmam, G.N.V.** – *Textbook of Human Nutrition*, Oxford & IBH Publishing, 4th Edition, 2019.

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

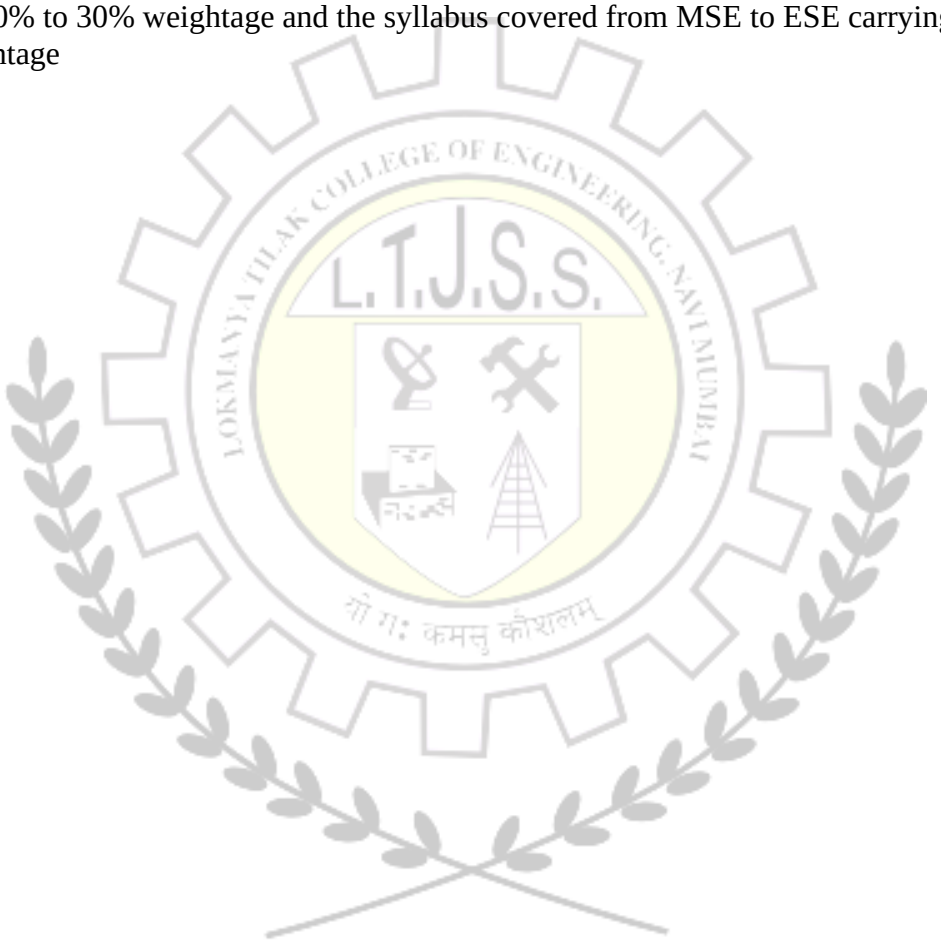
Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage



Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
EEMC401	**Digital Business Management**	--	50	--	--	--	50	

Prerequisite: Entrepreneurship and finance management	
Course Objectives: The course aims to	
1	Familiarize with digital business concept along with drivers
2	Acquaint with E-commerce
3	Understand and various approaches and techniques for E-business and management
4	Give insights into E-business and its strategies
Course Outcomes: Learners will be able to	
1	Understand the fundamental concepts and drivers of digital business management.
2	Analyze impact of e-commerce on business model
3	Develop insights into building digital business application & infrastructure.
4	Acquire knowledge management skills for E-business operations.
5	Understand different E-business strategies
6	Prepare business plan and analyze case study.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Introduction to Digital Business:**	08	**CO1**
	Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts Difference between physical economy and digital economy, **Drivers of digital business-** Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things(digitally intelligent machines/services) Opportunities and Challenges in Digital Business.		
02	**Overview of E-Commerce:**	05	**CO2**
	E-Commerce- Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement		

	B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC and Corporate portals. Other E-C models and applications, innovative EC System-From E-government and learning to C2C, mobile commerce and pervasive computing.		
	Self Learning Topic: OLA , UBER Application		
03	**Digital Business Support services:**	05	**CO3**
	ERP as e –business backbone, knowledge Tope Apps, Information and referral system **Application Development:** Building Digital business Applications and Infrastructure.		
	Self Learning Topic: ERP for some application		
04	**Managing E-Business:**	03	**CO4**
	Managing Knowledge, Management skills for e-business, Managing Risks in e –business Security Threats to e-business - Security Overview, Electronic Commerce Threats.		
05	**E-Business Strategy:**	04	
	E-business Strategic formulation- Analysis of Company‘s Internal and external environment, Selection of strategy, E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation)		**CO5**
06	**Materializing e-business:**	03	
	From Idea to Realization-Business plan preparation		**CO6**
	Self Learning Topic: Case Study		
		28	

Text Books:

1. Introduction to E-business-Management and Strategy, Colin Combe, ELSVIER, 2006
2. Trend and Challenges in Digital Business Innovation, VinocenzoMorabito, Springer
3. Electronic Commerce- A Managerial and Social Networks Perspective ,Eighth Edition,
   Efraim Turban ,David King ,Jae KyuLee,Ting-Peng Liang ,Deborrah C. Turban, Springer
4. Digital Business and E-Commerce Management, 6th Ed, Dave Chaffey, Pearson, August 2014
5. Digital Business Concepts and Strategy, Eloise Coupey, 2nd Edition, Pearson
6. Perspectives the Digital Enterprise –A framework for Transformation, TCS consulting journal
   Vol.5
7. Measuring Digital Economy-A new perspective- DoI:10.1787/9789264221796-enOECD

   Publishing

References:

1. E-commerce from vision to fulfilment, Elias M. Awad, PHI-Restricted, 2002

2. Digital Business Discourse Erika Darics, April 2015, Palgrave Macmillan
3. E-Governance-Challenges and Opportunities in : Proceedings in 2nd International Conference theory and practice of Electronic Governance
4. https://onlinecourses.nptel.ac.in/noc19_mg54/preview
5. https://nptel.ac.in/courses/110105083
6. https://onlinecourses.swayam2.ac.in/imb25_mg31/preview

Internal Assessment (50 Marks)

A. **Continuous Internal Evaluation (50 Marks)**
   1. Assignment: 15 Marks
   2. Quiz/Open book test: 10 Marks
   3. Case study/Presentation: 20
   4. Regularity and attendance: 5 Marks

Department of Electronics and Telecommunication Engineering
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Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2*+ 2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					2
VEC401	Business Communication Skills	-	25	-	-	-	25	

Prerequisite: Learners should have completed FE Semester I Professional Communication and Ethics course.	
Course Objectives: The course aims to enable learners to	
1	Draft effective Business and Technical Reports and Proposals
2	Learn impactful oral and visual aids to make effective presentations
3	Strategize and document business meetings
4	Lead people and successful projects using interpersonal skills
5	Apply Skills necessary for employment purposes and emerge successful
Course Outcomes: Learners will be able to	
1	Prepare well drafted documents like Business and Technical Reports and Proposals
2	Develop impactful presentations using oral and visual aids
3	Plan and prepare strategies for business meetings and document it
4	Manage and lead people and successful projects using interpersonal skills
5	Acquire skills for employment purposes to successfully navigate industry and career challenges

Module	Detailed Contents	Hrs.	CO Mapping
01	**Business and Technical Writing Skills**	8	CO1

	• Project based learning :Project Report Preparation
	  ○ Purpose and classification of reports
	  ○ Types of Reports
	  ○ Parts and Formats
	  ○ Preparation of a Report (Group work): Front Matter, Main matter, Back matter/Appended Pages etc.
	• Business Proposal		

	Self Learning Topic: 1. Business Vocabulary and Writing strategies 2. APA, MLA, IEEE style		

	3. Plagiarism checker tools		
02	**Business Presentation Skills** • Four *P*'s of Presentation (*Plan, Prepare, Practice, Perform*) • Making Effective Slides • Types of Presentation Aids • Closing a Presentation and Handling Questions • Group Presentation based on project Report **Self Learning Topic:** 1. Design softwares and Apps (e.g. Canva) 2. Social Media Presentation	**4**	**CO2**
03	**Business Meetings and Documentation** • Effective Meeting Strategies and Skills • Documentation of a Meeting: o Notice o Agenda, and o Minutes of a Meeting **Self Learning Topic:** 1. Meeting Roles and Responsibilities (Chairperson, Secretary, Analyst etc.)	**4**	**CO3**
04	**Interpersonal Skills** • Emotional Intelligence • Time Management • Assertiveness and Self confidence • Team building • Leadership • Conflict Resolution and Negotiation **Self Learning Topics:** 1. Oral speaking skills 2. Listening skills 3. Dressing etiquette	**6**	**CO4**
05	**Employment Skills** • Structured and Unstructured Group Discussions • Types of Group Discussions (Factual, Abstract, Strategic, Case Study, Picture based) • Resume Writing: How to build your Resume • Interview skills: o Formats (Structured, Behavioural, Situational, Stress, Case interviews etc.) o Types of Questions (Open ended, Closed, Hypothetical, Leading, Loaded etc.) o Strategies for successful interviews o Interview File o Mock Interviews **Self Learning Topic:** 1. Statement of Purpose (SOP) 2. Vocabulary building	**6**	**CO5**

	3. Sentence construction and Grammar rectifications.		
	Total	**28**	

Text Books:

1. Meenakshi Raman, Sangeeta Sharma, Technical Communication, Principles and Practice (2004), Oxford Press.
2. Bovee C.L. & Thill J.V. , Business Communication Today (2021), NJ: Pearson
3. Butterfield J., Verbal Communication: Soft Skills for a Digital Workplace (2017), Boston MA Cengage Learning.

References:

1. BCOLA-138 Business Communication - Course https://onlinecourses.swayam2.ac.in/nou25_cm09/preview
2. Business Communication Essentials - Course https://onlinecourses.swayam2.ac.in/imb25_mg05/preview
3. Softskills for Business - Course https://onlinecourses.swayam2.ac.in/imb25_mg87/preview

Suggested List of Assignments

Sr. No.	**List of Experiments**	**CO Mapping**
01	Synopsis of Report	CO 1
02	Print out of PPT slides	CO 2
03	Notice, Agenda and Minutes of Meeting	CO 3
04	Activity sheets of Interpersonal skills	CO 4
05	Employment skills record (Resume and Group Discussion)	CO 5

Continuous Internal Evaluation (25 Marks)

1. Assignment/ Role play/ Activity: 10 Marks
2. Project Book Report: 05 Marks
3. Project Presentation: 05 Marks
4. Regularity and attendance: 5 Marks

Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
ETPCL402	**Analog & Digital communication Lab**	-	25	25	-	-	50	

Prerequisite:	1. ETPCC302(Electronic Devices & Integrated Circuits) 2. ETPCC301(Digital System Design)
Course Objectives:	The course aims to
1	Give an understanding of Time and Frequency domain representation of signals.
2	Demonstrate analog and digital pulse communication.
3	Compare practical and Theoratical result
4	Verify result with simulation software to build communication circuits.
Course Outcomes:	Learners will be able to
1	Analyze analog modulation techniques.
2	Implement analog pulse modulation and demodulation circuits.
3	Evaluate the performance of various codes used in digital transmission system.
4	Demonstrate digital modulation and demodulation techniques.
5	Verify the concepts of TDM and FDM.
6	prepare laboratory report (Journal) to summarize the outcome of each experiment

Suggested List of Experiments

Sr. No.	List of Experiments	CO Mapping
1.	Observe amplitude modulation output waveform for different values of modulation index	CO1,CO6
2.	Demostrate amplitude demodulation using envelope detector.	CO1.CO6
3.	ObserveFrequency modulation output waveform for different values of modulation index	CO1.CO6
4.	Demostrate Frequency demodulation using .	CO1.CO6
5.	Discuss receiver performance by observing output waveform of different blocks used in system	CO1.CO6
6.	Decide different sampling frequency to study Sampling theorem.	CO2,CO6
7.	Compare Simulation experiment on analog modulation.	CO1.CO6
8.	Compare different types of digital Modulation (ASK FSK and PSK)	CO4.CO6
9.	Explain concept of Time division multiplexing .	CO5.CO6

10.	Explain concept of Frequency division multiplexing	CO5.CO6
11.	Discuss Pulse Code Modulation (PCM), its demodulation and its application in Time Division Multiplexing (TDM)	CO2.CO6
12.	Demonstrate Delta modulation.	CO2.CO6
13.	Observe performance of RZ and NRZ line coding.	CO3.CO6
14.	Analyse Error detection and correction using Hamming code virtual lab http://vlabs.iitb.ac.in/vlabs dev/labs/mit_bootcamp/comp_networks_sm/labs/exp1/index.php	CO3.CO6
15.	Implementation of huffman coding technique	CO3,.CO6

Continuous Internal Evaluation (25 Marks)

4. Lab Performance: 10 Marks
5. In-Semester Practical Exam during lab session: 10 Marks
6. Regularity and Attendance: 5 Marks

Laboratory plan:

At least 10 Experiments including not more than 02 simulations.One mini project in group of 4 students

Oral practical Exam(25Marks)

An Oral and Practical Exam will be held based on entire syllabus

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Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration(Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
ETPCL403	Microcontroller Lab	-	25	25	-	-	50	

Prerequisite: Digital System Design (ETPCC301)	
Course Objectives: The course aims to	
1	To evaluate and integrate development tools for effective system design and implementation for microcontroller based system
2	To study the addressing modes of 8051 and write the program to apply the same
3	To interface I/O devices to 8051 and write the program apply the same
4	To develop ARM 7 microcontroller based applications.
Course Outcomes: Learners will be able to	
1	Students will be able to utilize development tools to effectively design, simulate, and troubleshoot microcontroller-based systems.
2	Write assembly language programs for arithmetic and logical operations using various addressing modes.
3	Write assembly language programs for code conversion & data transfer operations.
4	Write assembly language programs for general purpose I/O, Timers & Interrupts.
5	Interface & write programs for Input and Output devices.
6	Develop microcontroller based Applications.

Suggested List of Experiments

Sr. No.	List of Experiments	CO Mapping
01	Explore the development tools to be used (Assembler, Linker , Compiler, Simulator, Emulator. IDE: like Keil.	C01
02	WAP in assembly language for 8051 to perform arithmetic & logical operations using various addressing modes.	C02
03	WAP in assembly language for 8051 to perform addition of series of numbers if data file in internal RAM, external RAM & program memory.	C02 & C03
04	WAP in assembly language for 8051 to perform sorting of series of numbers if data file in internal RAM, external RAM & program memory.	C02 & C03

05	WAP in assembly language for 8051 to perform arranging of series of numbers if data file in internal RAM, external RAM & program memory.	C02 & C03
06	WAP in assembly language for 8051 to Exchange & moving block of elements. Exchange block from internal RAM to internal RAM.	C03
07	WAP in assembly language for 8051 to Exchange & moving block of elements. Moving block from internal RAM to external RAM.	C03
08	WAP in assembly language for 8051 to Exchange & moving block of elements. Moving block from program memory to internal memory.	C03
09	WAP in assembly language for 8051 to Conversion of codes (Any One): 9.1) Binary to BCD 9.2) Binary to Gray etc.	C04
10	WAP in assembly language for 8051 for blinking LED. 10.1) Using Timer and Interrupt 10.2) Using Delay Subroutine.	C04
11	Interfacing and Programming of 7 Segment display to 8051.	C05
12	To write an ALP for 8051 Serial Communication (UART) to send string of characters on serial port.	C05
13	Basic programming using ARM to perform arithmetic & logical operations.	C03
14	ARM Microcontroller based Applications on simulators like – Traffic Light Controller	C06
15	ARM Microcontroller based Applications on simulators like – Touch less door bell,	C06
16	ARM Microcontroller based Applications on simulators like – 16 x 8 LCD Display interface.	C06

Continuous Internal Evaluation (25 Marks)

- Lab Performance: 10 Marks
- In-Semester Practical Exam during lab session: 10 Marks
- Regularity and Attendance: 5 Marks

Oral practical Exam(25Marks)

An Oral and Practical Exam will be held based on entire syllabus
CIE: At least 10 Experiments/hardware/software.

Department of Electronics and Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
ETCEP401	Mini Project 1	-	25	25	-	-	50	

Prerequisite: Electronics Devices , sensors, Integrated Circuit, Programming	
Course Objectives: The course aims to	
1	Make students familiar with the basics of Electronics, Arduino
2	Familiarize the students with the programming of Arduino
3	Acquire the students' knowledge of interfacing different devices with Arduino
4	Increase student's critical thinking ability and provide solutions to some real time problems.
Course Outcomes: Learners will be able to	
1	Identify the appropriate electronics devices, sensors, etc. required for given task
2	Write basic codes for Arduino
3	Apply the knowledge of interfacing different devices to the Arduino
4	Design circuit for given problem.
5	Analyze circuit to troubleshoot
6	Write the Technical report

Guidelines for Mini Project

- Students shall form a group of 3 to 4 students.
- Mini Project Coordinator will assign Guide.
- Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with Guide/supervisor/department faculty.
- Students shall submit implementation plan, which will cover weekly activity of mini project.
- In Project dairy weekly work progress to be mentioned, guide/supervisor will verify it and guide accordingly.
- Faculty supervisor may give inputs to students during mini project activity hour; however, focus shall be on self-learning.
- Review committee comments/changes/modification has to be incorporated by students and Guide will verify it.
- Students in a group shall understand problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.

- Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
- The solution to be validated with proper justification and report to be compiled in standard format given by Mini Project coordinator.
- Focus is on the self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the Mini Project.
- Use a free online simulation platform "Tinkercad" for the simulation of Arduino based circuits before implementing it in the hardware: https://www.tinkercad.com/

Guidelines for Assessment of Mini Project:

- **Term Work**
- The review/ progress monitoring committee will evaluate progress of work. Two reviews will be conducted.
- In continuous assessment focus shall also be on each individual student, assessment based on individual's contribution in group activity, their understanding and response to questions.
- Distribution of Term work marks is described in the log book. Guide will award marks accordingly.
- Mini Project shall be assessed based on following criteria;
    a. Quality of survey/ need identification
    b. Clarity of Problem definition based on need.
    c. Feasibility of proposed problem solutions and selection of best solution
    d. Cost effectiveness
    e. Societal impact
    f. Effective use of skill sets and standard engineering norms
    g. Contribution of an individual's as member or leader
    h. Clarity in written and oral communication

Guidelines for Assessment of Mini Project Practical/Oral Examination:

- Mini Project shall be assessed through a presentation and demonstration of working model by the student project group.
- Students shall be motivated to participate in project competition.
- Mini Project shall be assessed based on following points;
    1. Quality of problem and Clarity
    2. Cost effectiveness and Societal impact
    3. Full functioning of working model as per stated requirements
    4. Effective use of skill sets and standard engineering norms
    5. Contribution of an individual's as member or leader
    6. Clarity in written and oral communication

Sample Mini Projects

1. Remote Controlled Car
2. Fingerprint Sensor based door locking system
3. Ball Tracking Robot
4. Web Controlled Home Automation
5. Line Follower Robot
6. Smart Phone Controlled Home Automation

7. Web Controlled Surveillance Robotic Car
8. Weight Sensing Automatic Gate
9. Home Security System with Email Alert
10. Obstacle Avoiding Robot using Ultrasonic Sensor
11. Web Controlled Notice Board
12. RF Remote Controlled LEDs
13. RFID Based Attendance System
14. Interactive Led-Mirror
15. Garage Door monitor
16. Classroom Automation
17. Digital Code Lock
18. Electronic Voting Machine
19. Dynamic Traffic Monitoring
20. Bus Indication

Continuous Internal Evaluation (25 Marks)

1. Rubric 1: Evaluation of Weekly Progress: 05 Marks
2. Rubric 2: Topic Selection: 05 Marks
3. Rubric 3: End Semester Evaluation Seminar with working module: 10 Marks

Reference Books:

1. Simon Monk, "Hacking Electronic: Learning Arduino and Raspberry Pi", McGraw-Hill Education TAB; 2 edition , September 28, 2017.
2. Massimo Banzi , Michael Shiloh, "Getting Started With Arduino: The Open Source Electronics Prototyping Platform" March 22, 2022
3. Simon Monk "Programming Arduino: Getting Started with Sketches" McGraw-Hill Education 3rd Edition, November 2022.
4. Michael Margolis, Brian Jepson and Nicholas Robert Weldin "Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects" O'Reilly Media 3rd Edition, June 2020.

Software Tools:

1. Win32 Disk Imager: https://sourceforge.net/projects/win32diskimager
2. SD Card Formatter: https://www.sdcard.org/downloads/formatter
3. Arduino IDE: https://www.arduino.cc/en/main/software

Online Repository:

1. GitHub
2. NPTEL Videos on Arduino Programming
3. https://www.electronicsforu.com/arduino-projects-ideas
4. https://circuitdigest.com/arduino-projects
5. https://www.electronicshub.org/arduino-project-ideas/
6. SpokenTutorial Project-IITBombay: https://spokentutorial.org/tutorialsearch/?search_foss=Arduino&search_language= English

Oral practical Exam(25Marks)

An Oral and Practical Exam will be held based on entire syllabus

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Multidisciplinary Minor (MDM) (14 Credits)

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
CEMDM401	Data Structure and Algorithm	20	20	60	1	2	100	

Prerequisite: Concepts in C Programming and Python	
Course Objectives: The course aims to	
1	Introduce the fundamental knowledge & need of Data Structures and abstract the concept of Algorithm for problem solving.
2	Implement fundamental knowledge and applications of Stack, Queue, Linked List, Trees, Graphs etc.
3	Understand the working of different Sorting, Searching & Hashing techniques.
4	Understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.
Course Outcomes: Learners will be able to	
1	Classify and apply linear and non-linear data structure concepts and compare functions using asymptotic analysis to describe the relative merits.
2	Apply various operations on Stack and Queue.
3	Develop the ability to demonstrate the operations of Linked list.
4	Demonstrate and apply Trees & Graph data structures.
5	Analyse various Sorting and Searching Algorithms and their performance characteristics.
6	Describe the hash function and concepts of collision and its resolution methods

Module	Detailed Contents	Hrs.	CO Mapping

	Prerequisite: Control Structures, Arrays, Recursion, Pointers, Structures, Memory Allocation Techniques, Self-referential structures.		
01	**Introduction** Introduction to Data Structures, Concept of ADT, Types of Data Structures- Linear and Nonlinear, Operations on Data Structures. Algorithm: Performance characteristics of algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Introduction to Asymptotic Analysis and Notations.	**8**	**CO1**
02	**Stack & Queue** Introduction to Stack, ADT of Stack, Operations on Stack, Array Implementation of Stack. Applications of Stack- Infix Expression to Postfix Expression Conversion, Infix Expression to Prefix Expression Conversion, Postfix Expression Evaluation. Introduction to Queue, ADT of Queue, Operations on Queue, Array Implementation of Queue, Types of Queues, Applications of various types of Queues. **Self-Learning Topic:** Well form-ness of Parenthesis using Stack	**8**	**CO2**
03	**Linked List** Introduction, Representation of Linked List, Types of Linked List - Singly Linked List, Doubly Linked List. Operations on Singly Linked List and Doubly Linked List. Linked representation of Stacks, and Linked representation of Queues. Application of Linked List-Polynomial Representation and Addition. **Self-Learning Topic:** Linked List v/s Array.	**8**	**CO3**
04	**Trees & Graph** Introduction, Tree Terminologies, Binary Tree, Binary Tree Representation, Types of Binary Tree, Binary Tree Traversals, Binary Search Tree, Operations on Binary Search Tree, AVL tree. Applications of Binary Tree- Expression Tree, Huffman Encoding. Graph: Introduction, Graph Terminology, Memory Representation of Graph, Operations Performed on Graph. Graph Traversal, Breadth First Search, Depth First Search, Applications of the Graph, Shortest Path, Minimum Spanning Tree.	**9**	**CO4**
05	**Searching & Sorting** **Searching:** Sequential Search, Index Sequential Search, Binary Search **Sorting:** Bubble Sort, Quick Sort, Merge Sort, Selection Sort, Insertion Sort	**5**	**CO5**
06	**Hashing** Hashing-Concept, Hash Functions, Common hashing functions Collision resolution Techniques.	**4**	**CO6**

	Total	**42**	

Text Books:

1. Jean Paul Tremblay, P. G. Sorenson, “Introduction to Data Structure and its Applications”, McGraw-Hill Higher Education.
2. “Fundamentals of Computer Algorithms” Ellis Horowitz, Sartaj Sahani and Sanguthevar Rajasekaran, Second Edition, Universities Press (India) Pvt. Ltd.
3. “Learning with Python” Allen Downey, Jeffrey Elkner, Chris Meyers, Dreamtech Press.

References:

1. Jean Paul Tremblay, Paul G. Sorenson; An introduction to data structures with applications; Tata McGraw-Hill; 1984
2. Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, “Algorithms”, Tata McGraw-Hill Edition.
3. Narasimha Karumanchi, Data Structures and Algorithms, 5th Edition, CareerMonk, 2016.
4. https://nptel.ac.in/courses/106/102/106102064/

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
CEMDML401	Data Structure and Algorithm Lab	-	25	-	-	-	25	

Prerequisite:	
Course Objectives: The course aims to	
1	Introduce the essential concepts and requirements of data structures.
2	Apply fundamental knowledge and applications of Stack, Queue, Linked List, Trees, Graphs etc.
3	Understand the working of different Sorting, Searching & Hashing techniques.
4	Understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.
Course Outcomes: Learners will be able to	
1	Classify and apply linear and nonlinear data structure concepts, as well as perform operations including insertion, deletion, and traversal.
2	Apply various operations on Stack and Queue.
3	Develop the ability to demonstrate the operation of Linked list.
4	Demonstrate and apply Trees & Graph data structures.
5	Analyse various Sorting and Searching Algorithms and their performance characteristics.
6	Describe the hash function and concepts of collision and its resolution methods

Suggested List of Experiments

Sr. No.	List of Experiments	LO Mapping
01	Implementation of Insertion and deletion in a specific position in an Array using Function.	LO1
02	Array Implementation of Stack.	LO2
03	Array Implementation of Linear Queue.	LO2
04	Array Implementation of Circular Queue.	LO2
05	Implement Singly Linked List.	LO3
06	Implementation of Queue using Linked List.	LO3
07	Implementation of Stack using Linked list.	LO3
08	Implementation of Binary Search Tree and its traversal methods.	LO4
09	Program to count Number of leaf nodes, find the biggest and smallest and height of the tree.	LO4
10	Implementation of binary search and selection search algorithm.	LO5
11	Implementation of selection sort and insertion sort algorithm.	LO5
12	Study of hash function for immutable and mutable objects.	LO6
13	Program to illustrate how to hash a file	LO6

Continuous Internal Evaluation (25 Marks)

1. Lab Performance: 10 Marks
2. In-Semester Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ETMDM401	Microprocessor and Microcontroller	20	20	60	1	2	100	

Prerequisite: Basic electronics, Number systems, Computer Organization and Architecture	
Course Objectives: The course aims to	
1	Understand the architecture, operation, and memory organization of Intel 8086 microprocessor and 8051 microcontroller.
2	Prepare students for advanced processor architectures.
3	Explore instruction sets, addressing modes, and assembly language programming for Intel 8086 microprocessor and 8051 microcontroller to develop basic programs.
4	Analyze peripheral interfacing techniques with microcontrollers.
5	Apply microcontroller concepts in industrial process control.
Course Outcomes: Learners will be able to	
1	Describe the architecture, operation, and interrupt handling of the Intel 8086 microprocessor
2	Utilize Intel 8086 instruction sets, addressing modes, and assembly language programming to develop basic programs.
3	Demonstrate the architecture and architectural features of Intel 80386DX and Pentium processor
4	Illustrate the architecture and memory organization of the Intel 8051 microcontroller.
5	Apply instruction sets, addressing modes, and assembly language programming of the Intel 8051 microcontroller to develop basic programs.
6	Implement peripheral interfacing techniques and process control using the Intel 8051 microcontroller

Module	Detailed Contents	Hrs.	CO Mapping
01	**Intel 8086 Microprocessor Architecture** Intel 8086 Microprocessor features, Pipelined architecture and operation Intel 8086 Programmer's model, Memory banking Segmentation - Logical address, Offset and Physical address Multiplexed buses in 8086 processor and the demultiplexing Intel 8284 Clock generator- Power-on-reset and CK generation Minimum and Maximum mode configurations, Minimum mode timing diagram Interrupt mechanism and Interrupt processing in Intel 8086 processor	07	CO1

	(Self learn- Intel 8288 Bus Controller) **Self learning topic:** Intel 8288 Bus Controller		
02	**Intel 8086 Instruction Set and Programming** Major Instruction groups in Intel 8086 Microprocessor Data Transfer instructions, String instructions with repeat prefixes Arithmetic instructions, Rotate and Shift instructions Classification and concepts of branch instructions Addressing modes of Intel 8086 Microprocessor Simple programs based on the assembly language of Intel 8086 Microprocessor **Self learning topic:** Assembler directives	**07**	**CO2**
03	**Introduction to Intel 80386DX and Pentium Processor** Intel 80386DX Microprocessor- 32 bit Microprocessor architecture block diagram Registers of 80386DX processor- Data, Pointer, Index, Eflag and Control registers Operating modes- Real, Protected and V-86 modes Protected mode address translation mechanism Pentium processor – Features, Block diagram of pentium and it's Superscalar operation Integer and Floating point pipeline stages of Pentium L1 Data and Code Cache designs of Pentium Processor **Self learning topic:** Branch prediction, Pentium versions, Pentium-4's Net-Burst Architecture	**07**	**CO3**
04	**Intel 8051 Microcontroller Architecture** Block diagram of Intel 8051 Microcontroller Details of the general registers and SFR's Internal RAM and ROM organization I/O port functionality, Counters and timers, Serial ports Interrupt mechanism of 8051 controller and Interrupt priorities Interfacing external memory to 8051 microcontroller	**06**	**CO4**
05	**Intel 8051 Instruction Set and Programming** Major Instruction groups in Intel 8051 Microcontroller Data Transfer instructions, Logical and bit level instructions Arithmetic instructions Branching instructions – JUMP and CALL instructions Addressing modes of Intel 8051 Microcontroller Simple programs based on the assembly language of Intel 8051 Microcontroller	**07**	**CO5**
06	**Interfacing I/O devices to Intel 8051 Microcontroller** Concept of matrix keyboard interfacing Interfacing of 7-segment display, LCD display interfacing Stepper motor interfacing, Printer interfacing Interfacing High power devices through an Optoisolator, relays Concept of A/D and D/A converter interfacing Case study of Industrial Process Control system like liquid level control, temperature level control etc.	**08**	**CO6**
	Total	**42**	

Text Books:

1. John Uffenbeck: The 80X86 Family Design Programming and Interfacing, 2nd Edition, Pearson Education
2. Barry B. Brey: Intel Microprocessors, 2nd Edition, Prentice Hall Publication
3. Mazidi, Mazidi & McKinlay: The 8051 Microcontroller and Embedded Systems, 2nd Edition, Pearson Education
4. Raj Kamal: Microcontrollers Architecture, Programming, Interfacing and System Design, Pearson Education

References:

1. Douglas Hall: Microprocessors and Interfacing, McGraw Hill Publication
2. Kenneth Ayala: The 8051 Microcontroller, 3rd Edition, Thomson Learning
3. https://archive.nptel.ac.in/courses/108/103/108103157/
4. https://archive.nptel.ac.in/courses/108/105/108105102/

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
ETMDML401	Microprocessor and Microcontroller Lab	-	25	-	-	-	25	

Prerequisite: Basic electronics concepts	
Course Objectives: The course aims to	
1	Implement assembly language programs for Intel 8086 and 8051 microcontroller to perform various operations.
2	Interface general purpose peripheral devices with the Intel 8051 microcontroller for real-time applications.
Lab Outcomes: Learners will be able to	
1	Develop simple programs based on the assembly language of Intel 8086 Microprocessor using various instructions and addressing modes.
2	Write appropriate instructions for simple programs based on 8051 microcontroller
3	Interfacing of peripherals for 8051 microcontroller

Suggested List of Experiments

Sr. No.	List of Experiments	LO Mapping
01	Simple assembly language program for addition, subtraction and multiplication for 8086 processor.	LO1
02	Simple assembly language program for packed BCD arithmetic operations for 8086 processor.	LO1
03	Simple assembly language program for unpacked BCD arithmetic operations for 8086 processor.	LO1
04	Memory block transfer program for 8086 processor.	LO1
05	Finding largest/smallest number from given array.	LO1
06	Sorting the given array in ascending order.	LO1
07	Any program based on mixed language for 8086 processor.	LO1
08	Simple program for addition and subtraction for 8051 microcontroller.	LO2
09	Simple program for multiplication and division for 8051 microcontroller.	LO2
10	Software delay generator using 8051 microcontroller.	LO2
11	Interface single LED to 8051 microcontroller and write a program to blink that LED with some delay.	LO3

12	Interface 7-segment display to 8051and write a program to display a character on it.	LO3
13	Interface LCD panel to 8051 microcontroller and write a program to display a sample message.	LO3
14	Interface D/A converter to 8051 microcontroller and generate waveforms using this interface.	LO3
15	Stepper motor interfacing to 8051 microcontroller.	LO3

Continuous Internal Evaluation (25 Marks)

1. Lab Performance: 10 Marks
2. In-Semester Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ARMDM401	Artificial Intelligence	20	20	60	1	2	100	

Prerequisite:Discrete Mathematics, Data Structures	
Course Objectives: The course aims to	
1	To conceptualize the basic ideas and techniques underlying the design of intelligent systems.
2	To make students understand and Explore the mechanism of mind that enables intelligent thought and action.
3	To make students understand advanced representation formalism and search techniques.
4	To make students understand how to deal with uncertain and incomplete information.
Course Outcomes: Learners will be able to	
1	Ability to develop a basic understanding of AI building blocks presented in intelligent agents.
2	Ability to choose an appropriate problem solving method and knowledge representation technique.
3	Ability to analyze the strength and weaknesses of AI approaches to knowledge–intensive problem solving.
4	Ability to design models for reasoning with uncertainty as well as the use of unreliable information.
5	Ability to design and develop AI applications in real world scenarios.
6	Ability to understand Emerging AI Technologies and Future Trends in Mechanical Engineering.

Module	Detailed Contents	Hrs.	CO Mapping
01	**Fundamentals of AI and Machine Learning** Introduction to AI, Machine Learning (ML), and Deep Learning Role of AI in Mechanical Engineering Types of Machine Learning: Supervised, Unsupervised, and Reinforcement Learning Data Collection and Preprocessing for Mechanical Applications Case Study: AI-Driven Material Selection for Engineering	06	CO1
02	**AI in Mechanical Design and Product Development** Generative Design and AI-Assisted Computer-Aided Design (CAD) AI in Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD) Optimization Techniques for Mechanical Systems Using AI AI-Driven Topology Optimization for Lightweight Structures Case Study: AI in Aerospace Component Design.	07	CO2
03	**AI in Manufacturing and Smart Factories** AI in Industry 4.0 and Digital Twins Computer Vision for Quality Control and Defect Detection AI for Process Automation and Control in Manufacturing AI-Based Supply Chain and Inventory Management Case Study: AI-Powered Predictive Quality Control in Automotive Manufacturing	08	CO3
04	**AI in Robotics and Autonomous Systems** AI in Industrial Robotics and Automation Path Planning and Motion Control Using AI AI in Collaborative Robotics (Cobots) AI for Autonomous Vehicles and Drones in Mechanical Applications Case Study: AI-Driven Robotic Assembly System	08	CO4
05	**AI for Predictive Maintenance and Condition Monitoring** AI-Based Fault Detection and Diagnosis Machine Learning for Vibration Analysis and Wear Prediction IoT and AI Integration for Real-Time Condition Monitoring AI in Energy Efficiency and Performance Optimization Case Study: Predictive Maintenance in Heavy Machinery	07	CO5
06	**Emerging AI Technologies and Future Trends in Mechanical Engineering** AI for Sustainable and Green Engineering AI in Additive Manufacturing (3D Printing) AI in Human-Machine Interaction and Augmented Reality Ethical Considerations and Challenges in AI Adoption Capstone Project: AI-Driven Solution for a Mechanical Engineering Problem	07	CO6
	Total	42	

Text Books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition" Pearson Education, 2020.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning, First edition, 2011
3. George F Luger, "Artificial Intelligence" Low Price Edition, Fourth edition, Pearson Education.,2005
4. Ramin S. Esfandiari"Artificial Intelligence Techniques in Mechanical Engineering: A Practical Approach"McGraw-Hill Education.

References:

1.Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
2.Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication
3.Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson Education.
4.Elaine Rich and Kevin Knight, "Artificial Intelligence", Third Edition, McGraw Hill Education,2017 .

Useful Links

1.https://nptel.ac.in/courses/106/105/106105078/
2.https://thestempedia.com/blog/simple-ai-and-machine-learning-projects-for-students-and-beginners/
3.https://nptel.ac.in/courses/106/105/106105079/

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
ARMDML401	Artificial Intelligence Lab	-	25	-	-	-	25	

Course Objectives: The course aims to	
1	To provide hands-on experience in using AI and machine learning techniques for solving mechanical engineering problems like design, manufacturing, and maintenance.
Course Outcomes: Learners will be able to	
1	Familiar with basic tools for AI and prepare data for analysis.
2	Apply machine learning to predict mechanical properties.
3	Group similar data points (e.g., materials or components) without labeled data.
4	Use reinforcement learning to optimize a mechanical system & designing optimized mechanical structure.
5	Use machine learning to enhance FEA simulations & AI based quality control
6	Predict and diagnose mechanical failures before they happen. & path planning for robotics

Sr. No.	List of Experiments	CO Mapping
01	Introduction to Python for AI and Data Preprocessing	CO1
02	Using Supervised Learning for Mechanical Data	CO2
03	Clustering Mechanical Data (Unsupervised Learning)	CO3
04	Reinforcement Learning for System Optimization	CO4
05	Generative Design for Structural Optimization	CO4

06	AI in Finite Element Analysis (FEA)	CO5
07	AI-Based Quality Control	CO5
08	Predictive Maintenance Using AI	CO6
09	Path Planning for Robotics	CO6

Continuous Internal Evaluation (25 Marks)

1. Lab Performance and assignments: 10 Marks
2. In-Semester Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
ITMDM401	Internet of Things and Applications	20	20	60	1	2	100	

Prerequisite:Student should be able to a solid foundation in basic electrical principles, including AC circuits, magnetism, and electro mechanical energy conversion.	
Course Objectives: The course aims to	
1	Understand the fundamentals of IoT architecture and protocols.
2	Explore sensors, actuators, and embedded systems in electrical engineering.
3	Apply IoT technologies to solve electrical engineering problems.
4	Analyze case studies in smart grids, energy management, automation, and power systems.
Course Outcomes: Learners will be able to	
1	Understand the concept of IoT.
2	Illustrate IOT architecture and applications in various fields.
3	Demonstrate use Devices, Gateways and Data Management in IoT.
4	Understand various wired and wireless protocols.
5	Understand emerging technological options, platforms and case studies of IoT implementation in home & city automation.
6	Understand Data Analytics and Security in IoT.

Module	Detailed Contents	Hours	CO Mapping
01	**Introduction to IoT:**	**06**	**CO1**
	Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Sources of IoT; Sensing, Actuation, Basics of Networking; Software Architectures and Software Inter operability, Applications in Electrical Engineering.		
	Self Learning Topic: Privacy and Security		
02	**IoT Architecture:**	**06**	**CO2**
	Introduction, Functional View, Information View, Deployment and Operational View, Real-World Design Constraints- Introduction, Technical Design constraints, Data representation and visualization,		
	Self Learning Topic: Interaction and remote control.		
03	**Sensors and Embedded Systems**	**06**	**CO3**

	Types of Sensors Used in Electrical Applications (Voltage, Current, Power, Temperature), Interfacing Sensors with Microcontrollers (e.g., Arduino, Raspberry Pi, ESP32), Signal Conditioning and Data Acquisition, Postioning and localization, Medium access control, Introduction to Embedded Programming (C/C++, Python) **Self Learning Topic:** operating systems, time synchronization		
04	**Networking and Communication Protocols for IoT:** Cloud based IoT platforms, Zigbee and Zwave, advantage of low power mesh networking. Long distance Zigbee; Bluetooth/BLE: Low power vs high power, speed of detection, class of BLE. Wireless protocols such as Piconet and packet structure for BLE and Zigbee. Web Communication Protocols for connected devices, Web connectivity using Gateway, SOAP, REST, HTTP, RESTful and WebSockets (Publish –Subscribe), MQTT, AMQP, CoAP Protocols. **Self Learning Topic:** ThingsBoard, Blynk, Firebase, AWS IoT	**10**	**CO4**
05	**IoT Applications:** **IoT in Power and Energy Systems** Smart Grids and IoT Integration, Energy Monitoring and Management Systems, Real-time Load Monitoring, Predictive Maintenance of Electrical Equipment using IoT, Fault Detection in Power Lines, Smart Street Lighting Systems, IoT-enabled Electric Vehicle Charging Stations. **Industrial and Home Automation** IoT-based Control of Electrical Loads, Home Automation: Lighting, HVAC, Smart Meters, Industrial Automation: PLCs, SCADA Systems with IoT Integration, Safety and Fault Detection Systems. Case Study: Agriculture, Healthcare, Activity monitoring. **Self Learning Topic:** IoT for Renewable Energy Monitoring (Solar, Wind)	**10**	**CO5**
06	**Data Analytics and Security in IoT** Basics of Data Logging and Visualization, Introduction to Edge and Cloud Computing, Cybersecurity in IoT Systems, IoT Standards and Compliance **Self Learning Topic:** IEEE standards used in protection and data management.	**04**	**CO6**
	Total	**42**	

Text /Reference Books:-

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Misra, A. Mukherjee, and A. Roy, Introduction to IoT. Cambridge University Press, 2020.
3. S. Misra, C. Roy, and A. Mukherjee, Introduction to Industrial Internet of Things and Industry 4.0. CRC Press. 2020.
4. Adrian McEwen, Hakim Cassimally Designing the Internet of Things , John Wiley, 2014
5. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013.
6. CunoPfister, "Getting Started with the Internet of Things", OReilly Media, 2011

7. A. McEwen, H. Cassimally, “Designing the Internet of Things”, Wiley, 2013.
8. Samuel Greenguard, “Internet of Things”, MIT Press, 2015.
9. Mandler, B., Barja, J., Mitre Campista, M.E., Cagáová, D., Chaouchi, H., Zeadally, S., Badra, M., Giordano, S., Fazio, M., Somov, A., Vieriu, R.-L., Internet of Things. IoT Infrastructures, Springer International Publishing
10. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley-Blackwell.
11. Internet of things (IoT): Technologies, Applications, Challenges, and Solutions Edited by B.K. Tripathy J. Anuradha, CRC Press, 2018
12. Simone Cirani, Gianluigi Ferrari, Luca Veltri, “Internet of Things: Architectures, Protocols and Standards”

Web Reference /Video Courses
1. NPTEL Course: Introduction to Internet of Things By Prof. Sudip Misra, IIT Kharagpur

References:

1. Introduction to the Internet of Things (IoT), Publisher: Cisco Networking Academy

2. Internet of Things (IoT) – Lecture Notes & Tutorials, Author: Dr. Rajkumar Buyya (University of Melbourne)

3. A Reference Architecture for the Internet of Things, Publisher: IEEE / ITU-T

4. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, Author: Pethuru Raj

5. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases, Authors: David Hanes, Gonzalo Salgueiro, Patrick Grossetete

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)
Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)
1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)
End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
ITMDML401	Internet of Things and Applications-Lab	-	25	-	-	-	25	

Prerequisite: Students know the construction, working principle and operation of DC machines, transformers and Induction motors	
Course Objectives: The course aims to	
1	To Understand the definition and significance of the Internet of Things.
2	To Discuss the architecture, operation, and business benefits of an IoT solution.
3	To Explore the relationship between IoT, cloud computing, and Data Analytics.
4	To Explore the interconnection and integration of the physical world and be able to design & develop IOT applications.
Course Outcomes: Learners will be able to	
1	Adapt different techniques for data acquisition using various IoT sensors for different applications.
2	Demonstrate the working of actuators based on the collected data.
3	Use different IoT simulators and correlate working of IoT protocols.
4	Adapt different techniques for Integrating IoT services to other third-party Clouds.
5	Execute data analysis and encryption methodologies for deployment of IoT applications.
6	Implement IoT protocols for communication to realize the revolution of internet in mobile devices, cloud and sensor networks.

Suggested List of Experiments

Sr. No.	List of Experiments	CO Mapping
01	To measure voltage, current, and power consumption of an appliance using ESP32 and display the data on an OLED screen or send it to a cloud platform.	CO1
02	To control a light or appliance remotely using a mobile app (Blynk) using ESP32.	CO1
03	To measure room temperature and send the data to an online IoT platform using ESP32	CO1
04	To monitor transformer temperature and raise alerts on overheating.	CO2
05	To display power usage data from a sensor on a custom web dashboard using RasberyPi	CO2

06	To automate a streetlight system based on surrounding light intensity using ESP32	CO2
07	To monitor the ON/OFF status of an appliance and view it remotely using ESP32.	CO2
08	To detect motion and capture an image using Raspberry Pi camera using Raspberry Pi	CO2
09	Simulate an energy meter that calculates power usage using Arduino and sensors.	CO3
10	Simulate a weather station that logs temperature and humidity online using Tinkercad + ThingSpeak	CO3
11	Simulate an automatic light that turns on when it gets dark using Tinkercad or Proteus	CO3
12	Simulate a simple smart grid system that balances load using IoT control logic using MATLAB Simulink	CO3
13	Simulate control of home devices via mobile interface using Tinkercad + Blynk API Simulation	CO3
14	To study and demonstrate working of 6LoWPAN in Contiki OS (simulator)	CO4
15	Write a program on Raspberry Pi to push and retrieve the data from cloud like thingspeak/thingsboard/AWS/ Azure etc	CO4
16	Write a program to collect data from sensor encrypt data send it to receiver (server) and decrypt is at receiving end Ardino/Raspberry Pi/ Contiki OS (simulator)	CO5
17	To study and implement IoT Data processing using Pandas.	CO5
18	Write a program for Arduino / Raspberry Pi Publishing MQTT Messages to ESP8266	CO6
19	To study and implement interfacing of actuators based on the data collected using IoT sensors. (like led switch ON/OFF, stepper motor)	CO6
20	Write a program to Control Your ESP8266 From Anywhere in the World	CO6

Online References:

1. https://spoken-tutorial.org/watch/Arduino/Introduction+to+Arduino/English/

2. https://pythonprogramming.net/introduction-raspberry-pi-tutorials/

3. https://iotbytes.wordpress.com/basic-iot-actuators/

4. http://www.contiki-os.org/

5. https://www.bevywise.com/iot-simulator/

6. https://mqtt.org/

Continuous Internal Evaluation (25 Marks)

1. Lab Performance: 10 Marks
2. In-Semester Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
MEMDM401	Basics of Mechanical Engineering	20	20	60	1	2	100	

Prerequisite: Engineering Mechanics, chemistry,	
Course Objectives: The course aims to	
1	Explain: Fundamental concepts, laws of classical thermodynamics, principle of working and operation of thermodynamic cycles, scope and applications in research
2	To understand the nature of stresses developed in simple geometries
3	To understand the material used and their application in manufacturing
Course Outcomes: Learners will be able to	
1	Understand the fundamental concepts of Mechanical engineering
2	Understand & apply the basic laws of thermodynamics to analyze energy conversion systems
3	Understand the Basics of kinematics and various mechanism.
4	Understand the working principles and applications of common mechanical mechanisms such as linkages, gears.
5	Classify engineering materials and explain their mechanical properties, structure, and industrial applications.
6	Understand the working principles of Power Plants & types of Renewable energy sources

Module	Detailed Contents	Hrs.	CO Mapping
01	**Fundamentals of Mechanical Engineering** Introduction to Mechanical Engineering and its applications Basic concepts: systems, units, energy, force, work, power Engineering materials: types, properties, and applications Stress-strain basics and Hooke's Law Simple numerical problems on stress and strain	06	CO1
02	**Basics of Thermodynamics**	09	

	Introduction to Thermodynamics and basic definitions,Zeroth, First, and Second Laws of Thermodynamics,Properties of pure substances (pressure, volume, temperature),Heat and work interactions,Ideal and real gases. Introduction to heat engines, refrigerators, and heat pumps Introduction to I.C. Engines: SI and CI engines Engine components and working principles,2-Stroke vs 4-Stroke engines.		**CO2**
03	**Theory of Machines** Basics of kinematics and dynamics of machines,Types of links, kinematic pairs and chains,Four-bar mechanism, slider-crank mechanism,Gear trains: simple and compound,Cam and follower basics,Flywheel and governor (conceptual overview)	**07**	**CO3**
04	**Mechanical Systems and Machines** Basic machine elements: gears, belts, pulleys, bearings Introduction to mechanisms and kinematics of machines Simple lifting machines (screw jack, pulley block) Power transmission: shaft, couplings, and keys Basics of vibrations and balancing (introductory)	**08**	**CO4**
05	**Materials Science & Manufacturing Processes** Classification of materials: metals, ceramics, polymers, composites,Mechanical properties: hardness, toughness, ductility, strength,Heat treatment process. Overview of manufacturing: importance and types Basic casting process: pattern, moulding, and casting Introduction to welding, brazing, and soldering Basics of machining: turning, milling, drilling Introduction to 3D printing and modern manufacturing trends	**07**	**CO5**
06	**Power Plants & Renewable energy sources** Overview of power plants: thermal, hydro, nuclear (layout & working briefly) Renewable energy sources: solar, wind, biomass (brief)	**05**	**CO6**
	Total	**42**	

References & Text Books:

1. R.K. Rajput – *Basic Mechanical Engineering*
2. V. B. Bhandari – *A Textbook of Machine Design*
3. R.S. Khurmi – *Theory of Machines*
4. Kalpakjian & Schmid – *Manufacturing Engineering and Technology*
5. William D. Callister – *Materials Science and Engineering*

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)

End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
MEMDML401	Mechanical Engineering Lab	-	25	-	-	-	25	

Prerequisite:	
Course Objectives: The course aims to	
1	Practically verify the concepts learnt in theory course
2	Fundamental laws of thermodynamics through experimental analysis.
3	To acquaint with the material testing by performing experiment related to Hardness , Fatigue, Tension, , Deflection, Torsion, Impact and Flexural Test
Course Outcomes: Learners will be able to	
1	Verify Law of Thermodynamics & various boilers accessories and mountings
2	Understand and demonstrate the working of 2-stroke & 4-stroke Engine.
3	Verify the Bernoulli's Principle & Calibration of Venturimeter,Orifice meter
4	Perform Tension test to analyze the stress - strain behavior of materials
5	Perform heat treatment process of metal sample
6	Perform flexural test with central and multi point loading conditions

Sr. No.	List of Experiments	CO Mapping
01	Verification of the Zeroth Law of Thermodynamics.	CO1
02	Experiment on boilers and their accessories and mountings.	CO1
03	Demonstration of 2-stroke & 4-stroke Engine.	CO2

04	Calibration of Venturimeter,Orifice meter	CO3
05	Verification of Bernoulli's equation	CO3
06	Tension test on mild steel bar	CO4
07	Brinell hardness Test	CO4
08	Experiments based on heat treatment method	CO5
09	Flexural test on beam (Multi-point load)	CO6

Continuous Internal Evaluation (25 Marks)

1. Lab Performance and assignments: 10 Marks
2. In-Semester Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Lecture
		Marks Distribution			Exam Duration (Hrs)		Total Marks	3 Hrs
		Internal Assessment		End Semester Exam (ESE)	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					3
EEMDM401	Elements of Electrical Systems	20	20	60	1	2	100	

Course Objectives:

1. To list & describe the different methods of Power generation
2. To elaborate the various types of transmission lines
3. To understand the basics of illumination and various types of electrical loads
4. To understand and calculate the power consumption in electrical system
5. To explain the various types of electrical energy storage system
6. To discuss the various types of electrical meters

Course Outcomes:

1. Understand the different methods of Power generation
2. Evaluate the sending end and receiving end voltage of transmission line
3. Study the basics of illumination and various types of electrical loads
4. Understand the ratings and calculate the electrical energy consumption
5. Study the various types of electrical storage
6. Illustrate the working of different types of meters in electrical system

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
I	Generation of Electrical Power	Basics of different Power generating systems: thermal (fossil fuels, nuclear), renewable (solar, wind, hydro, geothermal), nuclear and emerging technologies (tidal, wave, biomass). Basic Layout of hydroelectric power station, thermal power plant, solar generation, nuclear power plant with their advantages and disadvantages. Cost of generation, peak load and base load plant.	**10**	**CO1**
II	Transmission	Study of different types of transmission lines (Short, medium and long) ,Different types of conductors used (Single and three phase transmission line).Application of KVL, KCL to find	**07**	**CO2**

		sending end and receiving end voltage and Calculations of Power transmitted.		
III	Utilization of Electrical Energy	Basic structure of Electrical power Generation, Transmission and distribution systems: grid structure. Illumination:Introduction,Terms used in illumination,Laws of illumination,Numericals on illumination. Types of Electrical loads: Residential:Basics of refrigeration and air-conditioning Industrial :Machines (Motors and generators: AC vs. DC) Self learning topics:Electric Heating and welding.Basics of DC motors,single and three phase induction motor.	**10**	**CO3**
IV	Ratings & Calculation of Energy Consumption	Power rating of household appliances such as tube light, fan, air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, understand the calculation of electricity bill for LT & HT consumers.	**05**	**CO4**
V	Energy Storage	Battery Technologies: Chemistry basics: lead-acid, lithium-ion, sodium-ion, solid-state batteries. Charging and discharging characteristics. Battery management systems (BMS). Battery storage: types (lead-acid, lithium-ion, flow batteries), applications.	**05**	**CO5**
VI	Measurement in Electrical Energy Systems	Importance of measurement in electrical energy systems. Basic principles of Digital and analog electrical measurement. Moving coil and Moving iron Ammeters & Voltmeters, Power measurement by wattmeter in single phase circuit	**05**	**CO6**
	Total		**42**	

Text Books:

1. Mahesh Verma, Power Plant Engineering, Metrolitan Book Co Pvt Ltd
2. RK Rajput, A Text Book of Power System engineering, Laxmi Publication
3. D. P. Kothari, I. J. Nagrath, Power System Engineering, 3 Edition, Mc GrawHill
4. B.R. Gupta, Power System Analysis And Design, S.Chand
5. Mehta V.K., Principles of Power System, S Chand
6. AK Sawhney, Electrical & Electronic Measurements and Instrumentation, Dhanpat Rai & Sons
7. Dincer I., and Rosen M. A. (2011); Thermal Energy Storage: Systems and Applications,Wiley

References:

1. W. D. Stevenson, Elements of Power System, 4 Edition TMH

2. Trevor M. Letcher, Storing Energy with Special Reference to Renewable Energy Source, Elsevier, 2016.
3. RS Sirohi & Radhakrisnan, Electrical Measurement & Instrumentation, New Age International

Online References:

Sr. No.	Website Name
1	https://www.energy.gov/eere/renewable-energy

Internal Assessment (40 Marks)

A. Mid Semester Exam (20 Marks)

Mid semester examination will be based on 40 % to 50% of the syllabus.

B. Continuous Internal Evaluation (20 Marks)

1. Assignment: 5 Marks
2. Quiz/Open book test/Presentation: 10 Marks
3. Regularity and attendance: 5 Marks

End Semester Examination (60 Marks)
End semester will be based on the syllabus coverage up to Mid Semester Examination (MSE) carrying 20% to 30% weightage and the syllabus covered from MSE to ESE carrying 70% to 80% weightage.

Department of Electronics & Telecommunication Engineering
Second Year Engineering Curriculum: Semester IV

Course Code	Course Name	Examination Scheme						Practical
		Marks Distribution			Exam Duration (Hrs)		Total Marks	2 Hrs
		Internal Assessment		Oral & Practical	MSE	ESE		Total Credits
		Mid Sem Exam (MSE)	Continuous Internal Evaluation (CIE)					1
EEMDML401	Elements of Electrical Systems Lab	-	25	-	-	-	25	

Course Objectives:

2. Evaluate the performance of transmission lines.
3. Understand the performance parameters of a generator.
4. Evaluate the characteristics of batteries.
5. Study the operation and performance of an electric motor.
6. Analyze the performance of renewable energy sources.
7. Familiarize with electrical measurement techniques.

Course Outcomes:

3. To study various aspects of performance of different renewable energy sources.
4. To study different types of lamps used in Electrical system..
5. To evaluate the efficiency and performance of DC machines (motor and generator) under varying speed and load conditions.
6. To demonstrate the effective use of various meters to perform voltage, current and power measurements of single and three phase circuits.
7. To study the nature of V-I characteristics for single phase and three phase loads.
8. To analyze the behavior of a transmission line under varying load conditions

Online Resources:

Sr. No.	Website Name
1.	https://www.vlab.co.in/broad-area-electrical-engineering
2.	https://www.vlab.co.in/broad-area-electronics-and-communications

Suggested List of Experiments:

Sr No	List of Experiments
01	Measure and plot the no load magnetization (open circuit) characteristic (V-I curve) of a DC generator.
02	Calculate efficiency and voltage regulation of DC generator using external characteristics.
03	Case study to get the current-voltage (I-V) characteristics of a solar PV panel under different light intensities (simulated using lamps).

04	Calculate the MPPT of a solar PV panel under different light intensities (simulation using lamps).
05	Measure speed-torque characteristics of a DC motor under different load conditions.
06	Calculate efficiency and analyze the starting and running performance of a DC motor under different load conditions.
07	Measure charge-discharge characteristics of different types of batteries (e.g., lead-acid, lithium-ion).
08	To analyze efficiency, capacity, and voltage profiles of different types of batteries (e.g., lead-acid, lithium-ion) (simulation based or hands on).
09	Perform voltage, current and power measurements in single phase circuit using analog meters and verify Ohm's law.
10	Perform voltage, current and power measurements in single phase circuit using digital meters and verify Ohm's law.
11	Perform voltage, current and power measurements in three phase circuit using analog meters and verify Ohm's law.
12	Perform voltage, current and power measurements in three phase circuit using digital meters and verify Ohm's law.
13	To perform load test using 1- phase and 3 phase sources and loads using MATLAB Simulink
14	To deduce the transmission line performance i.e. sending end voltage and receiving end voltage for long, medium and short transmission lines using MATLAB Simulink.
15	Generation of sinusoidal voltage waveform using MATLAB Simulink.
16	Simulation of transmission line model using MATLAB Simulink
17	To perform speed control of DC motor using MATLAB Simulink
18	To perform practical using breadboard to extract the charging and discharging characteristics of capacitor.
19	Case Study to compare efficiency and reliability of different renewable energy sources
20	Case Study to analyze the effectiveness of energy storage in balancing supply and demand in distribution networks.
21.	Study of different types of lamps and to measure the intensities of different lamps using lux meter.
22.	To measure voltage,current and power of different types of lamps.

Continuous Internal Evaluation (25 Marks)

1. Lab Performance: 10 Marks
2. Mid Semester Oral & Practical Exam during lab session: 10 Marks
3. Regularity and Attendance: 5 Marks