Courses/Teaching plan with details of number of Lectures on each unit of curriculum

1. Complete Scheme and Syllabus of B.Tech Programme of Studies, As approved by GGSIPU of B.Tech Programme of Studies (Affiliated Institutes) w.e.f. AS 2025-26 is uploaded on the website of the GGSIPU ' http://ipu.ac.in/Pubinfo2025/nt040825531%20(6).pdf'.
2.
3. Complete Scheme and Syllabus of B.Tech Programme of Studies, As approved by GGSIPU of B.Tech Programme of Studies (Affiliated Institutes) w.e.f. AS 2021-22 is uploaded on the website of the GGSIPU 'http://www.ipu.ac.in/Pubinfo2022/syllBTechAff130423.pdf'.

4. The approved syllabus for batches 2021-25 and 2022 onwards for B.Tech Programmes has been uploaded on the university website of the B.Tech corses running under USAR.
   Link: https://sites.google.com/view/ggsipuedc/academics/syllabusscheme?authuser=0#h.56neaubgto7o

5. Complete Scheme and Syllabus of MBA & BBA Programme of Studies is also approved by GGSIPU and are uploaded on the University website.
   MBA: http://www.ipu.ac.in/usms/USMS_Syllabus/syll011221/BBA.pdf
   http://www.ipu.ac.in/Pubinfo2022/nt0722536%20(7).pdf
   BBA: http://www.ipu.ac.in/Pubinfo2022/syllBBA2nd3rdyr280423.pdf

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Department of Electrical & Electronics Engineering

Power Systems-I Theory (EEC212)

Academic Plan for Semester-IV 2025-26

S. No.	TOPICS TO BE COVERED	Total No. of Lectures (42)	CO	Source of Lectures (Ref. No. from sources of lectures)
UNIT-I (Power System Components and Transmission Lines)				
1	Block diagram of electrical power system, Single line diagram of power system, brief description of power system elements such as synchronous, machine, transformer, transmission line, bus bar and circuit breaker.	2	CO1	R1, R3, and R5
2	Configuration of Transmission Lines and types of conductors.	1		R1, R3, and R8
3	Mechanical Design of Transmission Line: catenary curve, calculation of sag and tension, effects of wind and ice loading on sag.	3		R1, R3, and R4
4	Sag Template, Vibration Dampers; Overhead Lines Insulators: Types of insulators and their applications.	1		R1, R3, and R4
5	Potential Distribution over a string of Insulators, Methods of equalizing the potential.	3		R1, R3, and R4
UNIT-II (Overhead Transmission Lines)				
7	Corona and Interference: Phenomenon of corona, corona loss, factors affecting corona, methods of reducing corona, bundle conductors and Interference.	3	CO2	R1, R3, and R4
8	Calculation of resistance (skin & proximity effects), Inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines.	3		R1, R3, R4, and R5
9	Modelling and performance analysis of short, medium, and long transmission line.	3		R1, R5, and R7
10	Ferranti effect, Transposition of transmission conductors, surge impedance loading.	1		R1, R5, and R7
11	Introduction and analysis of travelling wave using Bewley's Diagram	1		R3, and R6
After Mid Term				
UNIT-III (Insulated Cables and Fault Analysis)				
13	Types of cables, and Dielectric Stress.	1	CO3	R1, and R3
14	Grading of Cables, Insulation Resistance.	3		R1, R2, and R3
15	Capacitance of single phase and three phase cables, Dielectric loss, and Heating of Cables.	3		R1, R2, and R3

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16	Fault Analysis: Per Unit System, and Symmetrical Components	2		R1, R2, R3, and R5
17	Fault Analysis: Calculation of Symmetrical and Unsymmetrical Fault, and use of Current Limiting Reactors	3		R1, R2, R3, and R5
UNIT-IV (Power Flow Analysis)				
18	Formulation of Y-bus Matrix, Power flow Equations.	2	CO4	R1, R5, and R7
19	Classification of Buses, Data for Load Flow	1		R1, R5 and R7
20	Gauss-Seidel Method, and Acceleration Factor of Convergence in Power Flow Analysis.	2		R1, R5, and R7
21	Newton-Raphson Method for Power Flow Analysis.	2		R1, R5, and R7
22	Fast Decoupled Load Flow Analysis, Comparison of Power Flow Methods	2		R1, R5, and R7

Sources for Power System-I Lectures

Ref. No.	Reference
R1	D P Kothari, and I J Nagrath, "Power System Engineering", Mc Graw Hill Publishing Company Limited
R2	Modern Power System Analysis by D P Kothari, and I J Nagrath, Mc Graw Hill Educating Private Limited
R3	Electrical Power Systems by Ashfaq Husain, CBS Publishers & Distributors
R4	Electrical Power Generation, Transmission and Distribution by S N Singh, PHI Learning Private Limited
R5	by John J Grainger, and Jr. Willam D Stevenson, "Power System Analysis", McGraw-Hill Publishing Company Limited
R6	A Course in Power Systems by J B Gupta, S K Kataria & Sons
R7	NPTEL Lectures- https://archive.nptel.ac.in/courses/108/104/108104051/
R8	Indian Electricity Rules
R9	Power System Analysis by Haadi Sadat

Additional List of Topics Covered Beyond the Curriculum

S. No.	Topic	Lecture no	PO/PSO Covered	Source
1.	Power flow through a transmission line	1	PO1, PO2, PO3, PO6, PO8, PSO1, PSO2	[R2], and [R7]
2.	Interpretation of the long line equations	3	PO1, PO2	[R2], and [R7]
3.	Role of SIL in transmission of electrical power	7	PO1, PO2, PSO1, PSO2	Self-Explanation

Course Outcomes of Power System-I (EEC-212)

C.212.1	To impart the knowledge of transmission line parameter.
C.212.2	To impart the knowledge of transmission line.
C.212.3	To impart the knowledge of cables.
C.212.4	To impart the knowledge of load flow studies.

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Department of Electrical & Electronics Engineering

Introduction to Control system Theory (EEC307)

Academic Plan for Semester-IV 2025-26

S. No.	TOPICS TO BE COVERED	CO	Total Lectures(42)
1	Control System Basics, Applications of Control Systems, Introduction to basic terms	CO1	1
2	Components, Classifications & types of Control System		1
3	Mathematical modeling of real life systems		1
4	Block diagrams, Transfer function		1
5	Numerical Practice (Block diagrams, Transfer function)		1
6	Determination of transfer function using Block diagram reduction techniques		1
7	Signal flow graphs, Mason's Gain formula		1
8	Determination of overall transfer function using Signal flow graphs		1
	Tutorial 1		1
9	Control system components: Electrical/ Mechanical/Electromechanical/A.C./D.C. Servo Motors		1
10	Stepper Motors, Tacho Generators, Synchros, Magnetic Amp lifiers, Servo Amplifiers.		1
11	Type & Order of System, Pole –zero plot		1
12	Time-domain Analysis of real life problems, Time domain performance specifications	CO2	1
13	Standard Test signals, Time response of first order system.		1
14	Time response of 2nd order system using standard signals.		1
15	Relationship between location of roots of characteristics equation		1
16	Time domain specifications of a general and an under-damped control system.		1
17	Tutorial 2		1
18	Design specifications of second order system		1
19	Steady state errors and static error constants in unity feedbac k control systems		1

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20	Numerical based on teady state errors and static error constants Standard Test signals, Time response of first order system		1
21	Response with P, PI and PID controllers		1
22	Realization of PID controller		1
23	Minimum/non minimum phase systems & Introduction to State Space		1
24	Frequency response of a system, relationship between time and frequency domain	CO3	1
25	Polar and inverse polar plots		1
26	Concept of stability from Polar plot		1
27	Bode plot, Determination of gain and phase margins from Bode plot		1
28	Relative stability, Stability analysis using Bode plot		1
30	Correlation of frequency domain performance with time domain performance		1
31	Tutorial 3		1
32	Limitations of frequency domain analysis, Design specifications in frequency domain		1
33	Root loci method		1
34	Concepts, absolute, asymptotic, conditional & marginal stability		1
35	Routh–Hurwitz criterion	CO4	1
36	Stability analysis using Routh–Hurwitz criterion		1
37	Nyquist stability criterion		1
38	Stability analysis using Nyquist stability criterion		1
39	Concepts of compensation, Concept of Lead and lag compensation		1
40	Series/parallel/series-parallel feedback compensation		1
41	Lag/Lead/Lag-Lead networks for compensation		1
42	Numerical practice based on compensation techniques.		1

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Sources for Introduction to Control system Lectures

Reference	Source
R1	Nagrath Gopal, Control System, Control System Engineering, Principle & Design, New Age International Publisher, 4th Edition, 2005
R2	Book: Richard C. Dorf, Robert H. Bishop, Modern Control Systems, Pearson
R3	Book: S. Salivahanan, R. Rengaraj, G.R.venkatakrishnan - Control Systems Engineering-Pearson
R4	Book:Samarjeet Ghosh, Control System Theory & Applications, Pearson Education
R5	Book:R.K. singh, Bhupesh Bhatis, Control system, Vayu Education of India
W1	Youtube link: https://www.youtube.com/watch?v=5NVjIIi9fkY
W2	Youtube link: https://www.youtube.com/watch?v=YQVHnDW-rTA
W3	NPTEL Lecture Link: https://www.youtube.com/playlist?list=PLxn52v8fxX5l5tGzU1NAxRDkgqxK0k5UZ
P1	Research Paper Link: **N. Nagpal** and J. Ohri, "Stability Analysis of Impedance type Haptic Interface", published in Proceedings of the International Conference on Circuits, Systems, Signal Processing, Communications and Computers Recent Advances in Electrical and Computer Engineering, Italy, ISBN: 978-1-61804-228-6, 2014
P2	https://www.ijirset.com/upload/2019/january/5_Design.pdf

Additional List of Topics Covered Beyond the Curriculum

S. No.	Topic	Lecture no	PO/PSO Covered	Source
1.	Applications of Control Systems	1	PO1, PO2, PO5, PSO1	self –explanation
2.	State Space Analysis	5	PO1, PO2, PSO1, PSO2	R1
3.	Realization of PID controller	22	PO1-PO4, PO11, PSO1, PSO2	R1

Course Outcomes of Introduction to Control system (EEC-307)

C.307.1	Ability to define, understand various terms related to control system and evaluation of transfer function.
C.307.2	Ability to apply knowledge of various types of signals in time response of systems.
C.307.3	Ability to analyze frequency response of systems.
C.307.4	Ability to design compensators and controllers.

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Department of Electrical & Electronics Engineering

Machine Learning Theory (ML407T)

Academic Plan for Semester-VII 2025

S. No.	TOPICS TO BE COVERED	Total No. of Lectures (42)	CO	Source of Lectures (Ref. No. from sources of lectures)
UNIT-I (Introduction to Machine Learning)				
1	Machine Learning, Terminologies in machine learning, perspective and issues in machine learning, application of machine learning	2	CO1	R1, and R2
2	Types of machine learning: supervised, unsupervised, and semi- supervised learning	2		R1, and R2
3	Review of probability	1		R1, and R2
4	Basic linear algebra in machine learning, Dataset and its types	2		R1, R2, and R3
5	Bias and variance in machine learning, Function approximation, and Overfitting	3		R1, R2, and R3
UNIT-II (Regression Analysis in Machine Learning)				
7	Introduction to regression and its terminologies	1	CO2	R1, R3, and R4
8	Types of regression: Linear and Logistic Regression	1		R1, R2, and R5
9	Linear Regression: Introduction to Simple Linear Regression and its assumptions, Simple Linear Regression Model Building, Ordinary Least Square estimation, Properties of the Least-Squares estimators and the fitted regression model, Interval Estimation in Simple Linear Regression, Residuals	3		R1, R2, and R5
10	Multiple Linear Regression: Multiple Linear Regression Model and its assumption, Interpret Multiple Linear Regression Model (R-squared, Standard Error)	3		R1, R3, and R5
11	Feature Selection and Dimensionality Reduction: PCA, LDA, ICA	3		R3, and R6
AFTER MID TERM EXAM				
UNIT-III (Introduction to Classification and Classification Algorithms)				
13	What is Classification? General approach to Classification, k-Nearest Neighbour Algorithm, Random Forests, Fuzzy Set Approaches	1	CO3	R4, and R5
14	Support Vector Machine: Introduction, Types of Support Vector: Kernel- (Linear kernel, Polynomial kernel, and Gaussian kernel); Hyperplane-	3		R4, and R5

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	(Decision surface); Properties of SVM, and Issues in SVM			
15	Decision Trees: Decision Tree learning algorithm, ID-3 algorithm, Inductive bias, Entropy and Information Theory, Information gain, Issues in Decision Tree learning	2		R1, R2, and R5
16	Bayesain Learning: Bayes Theorem, Concept Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks, EM algorithm	2		R1, R2, R3, and R5
17	Ensemble Methods: Bagging, Boosting-AdaBoost, and XBoost	1		R1, R2, R3, and R5
18	Classification Model Evaluation and Selection: Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value, Lift Curves and Gain Curves, ROC Curves, Misclassification Cost Adjustment to Reflect Real World Concerns, Decision Cost/ Benefit Analysis	3		
UNIT-IV (Introduction to Cluster Analysis and Clustering Methods)				
19	The Clustering Task and the Requirements for Cluster Analysis	1	CO4	R1, R5, and R7
20	Overview of Some Basic Clustering Methods: k-Means Clustering, k-Medoids Clustering	2		R1, R5 and R7
21	Density-Based Clustering: DBSCAN-Density Based Clustering based on Connected Regions with High Density, Gaussian Mixture Model Algorithm	2		R1, R5, and R7
22	Balance Iterative Reducing and Clustering using Hierarchies (BIRCH), Affinity Propagation Clustering Algorithm	2		R1, R5, and R7
23	Mean-Shift Clustering Algorithm, Ordering Points to Identify the Clustering Structure (OPTICS) Algorithm, Divisive Hierarchical Measuring Clustering Goodness	2		R1, R5, and R7

Sources for Power System-I Lectures

Ref. No.	Reference
R1	Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (India) Private Limited, 2013
R2	M. Gopal, "Applied Machine Learning", McGraw Hill Education
R3	C. M. Bishop, "Pattern Recognition and Machine Learning", Springer-Verlag, New York, 1st Edition 2006
R4	R. O. Duda, P. Hart, D. G. Stork "Pattern Classification", Wiley-Blackwell, 2nd Edition, 2000
R5	NPTEL Lectures- https://archive.nptel.ac.in/courses/108/105/108105104/

Course Outcomes of Power System-I (EEC-212)

C.407T.1	To formulate Machine Learning problems.
C.407T.2	To impart the knowledge of transmission line.
C.407T.3	To impart the knowledge of cables.
C.407T.4	To impart the knowledge of load flow studies.

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LECTURE PLAN

SUBJECT: POWER ELECTRONICS SUBJECT CODE: EEC -309

Total teaching week in semester: 14 week

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4 4

Total Lecture Classes Available: 53

S. No.	TOPICS TO BE COVERED	Lectures	Tutorials	CO achieve
	UNIT-I			
	INTRODUCTION			
1.	Syllabus, books, about subject, introduction to Power electronics and Application	1		
2.	Characteristics SCR, UJT, TRIAC, DIAC, GTO, MOSFET, IGBT, MCT and power BJT	2	1	**CO1**
3.	Two-transistor analogy of SCR SCR gate characteristics firing circuits of SCR and TRIAC	2		
4.	Switching Characteristics of SCR, turn on methods of SCR	1	1	
5.	Methods of commutation, Voltage and current rating of SCR	1		
6.	Protection of SCR, Driver circuits for BJT/MOSFET	2		
	Class test conducted	1		
	UNIT-II			
	A.C. TO D.C. CONVERTER			
8.	Classification of rectifiers	1		
9.	Working of single and three phase controlled rectifier	2		
10.	Fully controlled and half controlled rectifiers	2	1	
11.	Single-phase and three phase dual converter	1		
	D.C. TO D.C. CONVERTER			
12.	Classification of choppers	1		**CO2**
13.	Principle of operation of Buck, boost, buck-boost, cuk regulator	1		
14.	Switching mode regulators Buck, boost, buck-boost, cuk regulator	1	1	
	DC MOTOR DRIVES			
15.	Dc motor speed control	1		
16.	Controlled rectifier fed dc derives, chopper controlled dc drives	2	1	
	Quiz (MCQ)			
	UNIT III			
	D.C. TO A.C. CONVERTER			
17.	Single phase single pulse inverter: Square wave, quasi square	1		
18.	Three phase single pulse inverters (120'and 180°conduction) Modulation Techniques and reduction of harmonics	2	1	
19.	PWM techniques, SPWM techniques, SVM, Carrier less Modulation	1		**CO3**
20.	PWM Inverter, Bidirectional PWM converters	1		
21.	Voltage source inverters and current source inverter. Multi level Inverter: cascaded and NPC Inverters	1	1	
22.	Introduction of AC drives	1		
.	**Remedial lecture for below average students**	1		

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	UNIT-IV			
	A.C TO A.C CONVERTER			
23.	Ac voltage controller	1		
24.	Cyclo-converters: single phase to single phase, three phase to single phase, three phase to three phase	2	1	
25.	Cyclo-converter circuit and their operation, Matrix converter.	1		
	INDUCTION MOTOR DRIVES			**CO4**
26.	Three phase induction motor starting, braking	1		
27.	Speed control from stator and rotor sides, stator voltage control	1		
28.	Variable frequency control from voltage sources and current Sources	1	1	
	Class test conducted	1		
	Remedial lecture for below average students	1		
	TOPICS BEYOND CURRICULUMN			
29.	Characteristics Of IGCT, static induction thyristors, SUS, SBS, LASCR	1		**CO1**
30.	Effect of source impedance	1		**CO2**
31.	Multipulse Converter	1		**CO3**
32.	Design and analysis of resonant converter chopper	1		**CO4**

1

Course Objectives

C.309.1	To learn the operation characteristics and firing circuits of power electrons devices.
C.309.2	To acquire knowledge of controlled rectifier and choppers control DC Motors
C.309.3	To get the exposure of square wave, Quasi square wave PWM and multilevel inverters there use to control AC drives
C.309.4	To apply AC controllers cyclo converter and matrix converter to control induction motors

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Department of Electrical & Electronics Engineering

Principles of Management for Engineers (MS-302)

ACADEMIC PLAN FOR SEMESTER-VI (2025-26)

S.No.	TOPICS TO BE COVERED	Total No. of Lectures (42)	CO	Text/References
	UNIT-I (Introduction to Managers and Management)			
1	Management an Overview: Introduction, Definition of Management, Role of Management	2	CO1	[T1][R2]
2	Functions of Managers, Levels of Management	2		[T1][R2]
3	Management Skills and Organizational Hierarchy, Social and Ethical Responsibilities of Management: Arguments for and against social Responsibilities of Business	3		[T2][R1]
4	Social Stake holders, Measuring Social Responsiveness and Managerial Ethics, Omnipotent and Symbolic View	2		[T1][R1][R2]
5	Characteristics and importance of organizational culture, Relevance of political, Legal, economic and Cultural environments to global business	2		[T1][R1][R2]
6	Structures and techniques organizations use as they go international	1		[T1][R1][R2]
	UNIT-II (Planning)			
7	Nature & Purpose, Steps involved in Planning, Objectives, Setting Objectives	2	CO2	[T1][R2]
8	Process of Managing by Objectives, Strategies, Policies & Planning Premises	2		[T1][R5]
9	Competitor Intelligence, Benchmarking, Forecasting, Decision-Making.	2		[T1]
10	Directing: Scope, Human Factors, Creativity and Innovation, Harmonizing Objectives, Leadership, Types of Leadership, Directing, Managers as leaders, Early Leadership Theories, Trait Theories	3		[T1][R3]

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11	Behavioral Theories, Managerial Grid, Contingency Theories of Leadership, Directing Path Goal Theory, contemporary views of Leadership, Cross Cultural Leadership, Leadership Training, Substitutes of Leadership	2		[T1][R3]
UNIT-III (Organizing)				
12	Organizing, Benefits and Limitations-De-Centralization and Delegation of Authority	2	CO3	[T1][R3]
13	Authority versus Power,Mechanistic Versus Organic Organization ,Common Organizational Designs	2		[T1][R3]
14	Contemporary Organizational Designs and Contingency Factors, The Learning Organization Nature and Purpose	2		[T1][R3]
15	Formal and Informal Organization, Organization Chart, Structure and Process, Departmentalization by difference strategies,	2		[T1][R2]
16	Departmentalization by difference strategies, Line and Staff authority- Benefits and Limitations-De-Centralization and Delegation of Authority Versus, Staffing, Human Resource inventory, Job Analysis , Job Description, Recruitment	2		[T1][R2]
UNIT-IV (Controlling)				
17	Introduction to Controlling System and processof Controlling, Requirements for effective control	2	CO4	[T1][R3]
18	Theplanning Contol link, The process of control, types ofcontrol The Budget as Control Technique, InformationTechnology in Controlling	3		[T1][R2]
19	Productivity, Problems andManagement, Control of Overall Performance, Direct andPreventive Control, Financial Controls	2		[T1][R4] [T1][R4]
20	Tools formeasuring organizational Performance, Contemporaryissues in control Workplace concerns, employee theft,empIoyee violence	2		[T1][R4]

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Course Objectives

C.302.1	Evaluate the relevance of the political, legal, ethical, economic and cultural environments in global business.
C.302.2	Evaluate approaches to goal setting, planning and organizing in a variety of circumstances.
C.302.3	Evaluate contemporary approaches for staffing and leading in an organization
C.302.4	Analyze contemporary issues in controlling for measuring organizational performance.

Text Book and References books used by Faculty:

[T1]. Tripathi PC. Principles of management. Tata McGraw-Hill Education; 6th Edition 2017.

[R1]. Koontz H, Weihrich H. Essentials of management: an international, innovation, and leadershipperspective. McGraw-Hill Education; 10th Edition 2018.

[R2]. Principles of Management Text and Cases, Pravin Durai , Pearson ,2015

[R3]. Robbins, S.P. &Decenzo, David A. Fundamentals of Management,7th ed., Pearson, 2010

[R4]. Robbins, S.P. & Coulter, Mary Management; 14 ed.,Pearson , 2009

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Department of Electrical & Electronics Engineering

Economics and Policies of e-Mobility (EV-415)

ACADEMIC PLAN FOR SEMESTER-VII EEE

S.No.	TOPICS TO BE COVERED	Total No. of Lectures (56)	CO
	UNIT-I (Indian and Global Scenario)		
1	Indian and Global EV Technology and Market Scenario.	2	CO1
2	Policies and Regulations.	2	
3	Payback and Commercial Model Policies in India.	2	
4	Classification and Specification of Vehicles.	2	
5	Homologation and its Types,	2	
6	Type Approval Scheme.	1	
7	Regulations Overview (EEC, ECE, FMVSS, AIS, CMVR)	2	
8	Research on Aluminium-ion Battery Technology.	1	
	UNIT-II (Dynamic Testing of Vehicle)		
9	Speedometer Calibration.	2	CO2
10	Range Test,	1	
11	Maximum Speed Test.	2	
12	Acceleration Test.	2	
13	Coast Down Test.	2	
14	Brakes Performance ABS Test.	2	
15	Broadband / Narrowband EMI Test.	2	
16	Replacement of Copper with Alternative Material or its alloy for Winding of Electric Motor.	1	

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After Mid Term			
UNIT-III (Vehicle Component Testing)			
17	Horn Testing.	2	CO3
16	Safety Glasses Test, Windscreen Laminated and Toughened safety Glass.	2	
17	Rear View Mirror Test.	1	
18	Hydraulic Brakes Hoses Fuel Tank Test.	1	
19	Metallic and Plastic Hinges and Latches Test.	1	
20	Tyre and Wheel Rim Test.	1	
21	Bumper Impact Test.	1	
22	Side Door Intrusion, Crash Test with Dummies	2	
23	Demist Test, Defrost Test.	2	
24	Research on Novel Material Composition for Battery Pack and Cell Casing.	1	
UNIT-IV (Static Testing of Vehicle)			
25	CMVR Physical Verification.	2	CO4
26	Tyre Tread Depth Test.	2	
27	Vehicle Weighment.	1	
28	Horn Installation.	1	
29	Rear View Mirror Installation.	1	
30	External Projection, Tell- tale, Wheel Guard.	2	
31	Arrangement of Foot control for M1 Vehicle.	1	
32	Angle and Dimensions Measurement of Vehicle.	1	
33	Requirement of Temporary Cabin for Drive away, Chassis.	2	
34	Research on Dynamic Charging System for EV.	1	

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Department of Electrical & Electronics Engineering

Utilization of Electrical Energy (EEE-320T)

ACADEMIC PLAN FOR SEMESTER-VI 2025-26

S.No.	TOPICS TO BE COVERED	Total No. of Lectures (44)	CO
	UNIT-I (Illumination)		
1	Introduction, Terms used in Illumination.	2	CO1
2	Laws of Illumination, Polar Curves	2	
3	Photometry, Integrating Sphere.	2	
4	Sources of Light: Discharge Lamps, Mercury Vapour and Sodium Vapour Lamps, Performance Comparison between Tungsten Filament, Fluorescent Tubes, CFL and LED Lights.	2	
5	Basic Principles of Light control; Types and Design of Lighting Schemes and Flood Lighting.	2	
6	**An Advanced Lighting System combining solar and an artificial source constant illumination and energy saving in buildings.**	1	
	UNIT-II (Electrical Heating, Welding)		
7	Principle and Application of Resistance, Induction and Dielectric Heating, Infrared or Radiant Heating.	2	CO2
8	High Frequency Eddy current heating, Arc Furnace, Induction Furnace. Electric supply for high frequency heating applications.	2	
9	Resistance Welding, Arc Welding, Comparison between Resistance and Arc welding	2	
10	Welding Generator and Welding Transformer.	2	
11	Properties of Arcing Electrode, Comparison between A.C. and D.C welding.	2	
12	**How Ultrasonic Welding Works**	1	

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After Mid Term			
UNIT-III (Electrical Traction)			
13	Advantages of Electric Traction, Requirements of an Ideal Traction System, Different Systems of Electric Traction.	2	CO3
14	Comparison between D.C. and A.C systems of Railway Electrification; speed- time curves.	2	
15	Different types of Traction Motors and their characteristics; parallel operation of Traction Motors.	2	
16	Starting and Speed Control of 3-phase Induction Motors	2	
17	Braking; Advantages and Disadvantages of regenerative braking, Calculation of Energy returned during regeneration.	2	
18	**Advancements in Electric Vehicle Traction Inverter Design- Evolution of Traction Inverters.**	1	
UNIT-IV (Electroplating, Energy Storage Devices)			
19	Principles and Applications of Electrolysis, Faraday's Law of Electrolysis.	2	CO4
20	Electroplating; Calculation of current required for depositing given amount of metal. Current Efficiency, voltage- energy efficiency.	2	
21	Extrction of metals electro deposition, factors governing deposition process.	2	
22	Constructional Details, Principle of Operation of Rechargeable Alkaline, Ni-Cd, Nickle- Metal Hydride, Lithium ion and Lead – Acid batteries, their comparison and applications.	2	
23	Charging of batteries and rating, Fuel cells and use of electric double layer capacitor (super capacitor) as battery bank.	2	
24	**Long Duration Energy Storage (LDES), Integration of Hydrogen Liquefaction Process (HLP) and Liquid Air Energy Storage (LAES).**	1	

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Department of Electrical & Electronics Engineering

Network Analysis and synthesis Theory (EEC206)

ACADEMIC PLAN FOR SEMESTER-IV Jan-2025-26

S.No.	TOPICS TO BE COVERED	Total No. of Lectures (42)	CO	Text/References	Remarks
1	Application of Mesh current analysis,	2	CO1	[T1][R5]	Pg.34-48 Pg.72-90
2	Node voltage analysis	2		[T1][R2]	Pg.50-56 Pg.110-120
3	Network theorems in AC circuits	3		[T2][R5]	Pg. 11-28 Pg. 36-39
4	Graph theory: concept of tree, tie set matrix	2		[T1][R1][R2]	Pg. 121-128 Pg. 136-139 Pg. 21-29
5	Cut set matrix and application to solve electric networks	2		[T1][R1][R2]	Pg. 151-188 Pg. 96-109 Pg. 56-59
	UNIT-II (Transient Analysis)				
7	Periodic Waveforms: Synthesis and Laplace Transform for Periodic & other complex waveforms.	2	CO2	[T2][R2][R4]	Pg. 111-138 Pg. 48-59 Pg. 36-49
8	System modeling in terms of differential equations and transient response of R, L, C series circuit.	2		[T2][R5][W2]	Pg. 71-98 Pg. 58-69
9	System modeling in terms of differential equations and transient response of R, L, C parallel circuit.	2		[T2][W2]	Pg. 68-89
10	System modelling of impulse, step, ramp, sinusoidal and exponential signals by classical method	3		[T2][R3]	Pg. 151-198 Pg. 358-369

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11	System modelling of impulse, step, ramp, sinusoidal and exponential signals by using Laplace transform.	2		[T2][R3]	Pg. 271-298 Pg. 158-169
	UNIT-III(Two-Port Networks)				
13	Introduction of Two-Port Networks, Various parameters and their inter-conversion	2	CO3	[W1][T2][R3]	Pg. 91-108 Pg. 98-109
14	Inter-connections of two port networks	2		[W1][T2][R3]	Pg. 109-153 Pg. 38-69
15	Open-circuit & short circuit Impedances, Image Impedances and their inter-relation	2		[W1][T2][R3]	Pg. 172-176 Pg. 103-127
16	Network Functions, their properties and concept of Transform Impedances	2		[T1][R2]	Pg. 101-189 Pg. 78-99
17	Network Synthesis : Hurwitz Polynomial and Properties	2		[T1][R2]	Pg. 111-198 Pg. 88-90
18	Positive Real Functions & Properties, Testing a function to be p.r.f.	2	CO4	[T1][R3]	Pg. 99-128 Pg. 108-139
19	Synthesis of One-port Networks with two kinds of elements : LC, RC & RL in Foster's-I & II Form and in Cauer's I & II Form	3		[T1][R2]	Pg. 180-188 Pg. 108-110
20	Introduction of Passive Filters, their properties & classification as LPF, HPF, BPF	2		[T2][R4]	Pg. 121-145 Pg. 141-149
	& Band Reject Filters			[T2][R4]	Pg. 161-178 Pg. 89-99
21	Frequency Response & Characteristic Impedance of the LPF, HPF, BPF & Band Reject prototype section	3		[T2][R4]	Pg. 291-301 Pg. 198-209

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Course Objectives

C.206.1	Understand the system and signal's classification and response using Laplace transformation.
C.206.2	Acquire knowledge of R-L-C series and parallel network's transient response using Laplace
C.206.3	Comprehend concept of two port networks by learning about their interconnection.
C.206.4	Identify realizable network function and synthesize them to apply in design of passive filters.

Text Book and References books used by Faculty:

[T2]. Kuo, "Network analysis and synthesis" John Weily and Sons, 2nd Edition.
[R1]. S Salivahanan "Circuit Theory " Vikas Publishing House 1st Edition 2014
[R3]. Bhise, Chadda, Kulshreshtha, "Engineering network analysis and filter design" Umesh publication, 2000.
[R4]. D. R. Choudhary, "Networks and Systems" New Age International, 1999
[R5]. Abhijit Chakrabarti, " Circuit Theory Analysis and Synthesis", Dhanpat Rai & Co.

Web material used by Faculty:

[W1]. Said, Lobna & Radwan, Ahmed & Madian, Ahmed & Soliman, A.M.. (2011). Two port network analysis for three impedance based oscillators. Proceedings of the International Conference on Microelectronics, ICM. 10.1109/ICM.2011.6177421.

[W2]. Evgeny, Barkanov & Hufenbach, W. & Kroll, L.(2003). Transient response analysis of systems with different damping models. Computer Methods in Applied Mechanics and Engineering. 192. 33-46. 10.1016/S0045-7825(02)00495-4.

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Department of Electronics & Communication Engineering

Digital Logic and Computer Design (ECC-207)

ACADEMIC PLAN FOR SEMESTER-III, Aug-2025-26

S.No.	TOPICS TO BE COVERED	Total No. of Lectures (42)	CO	Text/References
	UNIT-I			
1	Review of number systems, signed, unsigned, fixed-point, floating-point numbers, Binary Codes, Boolean algebra – basic postulates, theorems.	5	CO1	[T1][R1][R2]
2	Simplification of Boolean function using Karnaugh map and Quine-McCluskey method	2		[T1][R2][R3]
3	Implementations of combinational logic functions using gates, Adders, Subtractors, Magnitude comparator, encoder and decoders, code converters, parity generator/checker	3		[T1][R1][R2] [R3]
4	Multiplexers and implementation of combinational circuits using multiplexers.	2		[T1][R1][R2] [R3]
	UNIT-II			
6	General model of sequential circuits, Flip-flops, latches, level triggering, edge triggering, master slave configuration	3	CO2	[T1][R1][R3]
7	Concept of state diagram, state table, state reduction procedures	2		[T1][R1][R2][R3]
8	Design of synchronous sequential circuits, up/down and modulus counters,	3		[T1][R1][R2][R3]
9	shift registers, Ring counter, Johnson counter, timing diagram, serial adder, sequence detector	2		[T1][R1][R2][R3]
10	Programmable Logic Array (PLA), Programmable Array Logic (PAL), Memory Unit, Random Access Memory	2		[T1][R1][R5]
	UNIT-III			

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11	Stored Program, Organization, Computer registers, bus system, instruction set completeness, Register Transfer Language, Arithmetic, Logic and Shift Micro-operations	3	CO3	[T2] [R4]
12	Instruction Codes, Design of a simple computer, Design of Arithmetic Logic unit, shifter, instruction cycle, Design of a simple hardwired control unit, Programming the basic computer	4		[T2] [R4]
13	Machine language instructions, assembly language, Microprogrammed control, Horizontal and Vertical Microprogramming, Central Processing Unit	2		[T2] [R4]
14	Instruction sets and formats, addressing modes, data paths, RISC and CISC characteristics.	2		[T2] [R4]
	UNIT-IV			
15	Computer Arithmetic, addition, subtraction, multiplication and division algorithms,	4	CO4	[T2] [R4]
16	Input-Output Organization, Modes of data transfer, Interrupt cycle, direct memory access, Input-Output processor	3		[T2] [R4]
17	Memory Organization, Memory Hierarchy, Associative Memory, Cache Memory, Internal and external Memory, Virtual Memory.	3		[T2] [R4]



Course Objectives

C.207.1	Ability to understand Boolean Algebra and design combinational circuits.
C.207.2	Ability to design and understand sequential circuits.
C.207.3	Ability to understand design of a basic computer.
C.207.4	Ability to understand input output and memory organization of the computer.

Textbooks and References books used by Faculty:

[T1] M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016
[T2] M. Morris Mano, Rajib Mall “Computer System Architecture”, 3rd Edition Pearson Education, 2017
[R1] Leach, D. P., Albert P. Malvino, “Digital Principles and Applications”, McGraw Hill Education, 8th Edition, 2014
[R2] Jain, R.P. ,”Modern Digital Electronics”, McGraw Hill Education, 4th Edition , 2010 [R3] Floyd, Thomas L. , “Digital Fundamentals” Pearson Education, 11th Edition, 2017 [R4] M. Rafiquzzaman, “Fundamentals of Digital Logic and Microcomputer Design”, Wiley, 5th Ed., 2005.

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Additional web-based resources:

1. **NPTEL:** An extensive course by renowned professors covering fundamental and advanced concepts of Signals and Systems.
   Link: **https://onlinecourses.nptel.ac.in**

2. **MIT Open Course Ware:** Offers lecture notes, video lectures, and problem sets from MIT's course on Signals and Systems.
   Link: **https://ocw.mit.edu**

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Department of Electrical & Electronics Engineering

Electrical and Electronics Measuring Instruments (EEC-305)

ACADEMIC PLAN FOR SEMESTER-V 2025-26

S.No.	TOPICS TO BE COVERED	Total No. of Lectures (42)	CO
	UNIT-I [Power and Energy Measurement]		
1	Instrument Transformers: CT and PT, Ratio and phase angle errors.	2	CO1
2	Measurement of Power :Single phase and three phase dynamometer type wattmeter, LPF and UPF	2	
3	Expression for deflecting and control torques , Type of P.F. Meters, dynamometer and moving iron type, Frequency meters, Resonance type and Weston type, Synchoroscopes.	3	
4	Measurement of Energy :Single phase and three phase induction type energy meter, driving and braking torques	2	
5	Errors and compensations, testing by phantom loading, trivector meter, maximum demand meters.	2	
	UNIT-II [Potentiometer and Bridges]		
7	Principle of operation and types of D.C./A.C. potentiometers, application of D.C./A.C. Potentiometers.	2	CO2
8	Bridges for measuring low ,medium and high resistance	2	
9	Carey Foster's bridge, Kelvin's double bridge, Megohm bridge, Megger	2	
10	A.C. Bridges: Measurement of inductance and capacitance , Maxwell's bridge , Hay's bridge , Anderson's bridge, Owen's bridge , Heaviside bridge and its modification	3	

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11	Desauty bridge,Wein bridge ,Schering bridge	2	
After Mid Term			
UNIT-III [Display Devices and Recorders]			
13	Introduction of various display devices, LCD, LED and plasma display	2	CO3
14	CRO & its applications, triggered CRO, sampling oscilloscope	2	
15	Recorders: Requirement of recording data, selection of recorder for a particular application	2	
16	Analog, graphic, strip chart, galvanometric, circular chart, XY, digital recorders, single point and multipoint recorders	2	
17	Types of Printers, Drum type printer, dot matrix type printer , Ink-jet and Laser jet printers	2	
UNIT-IV [Transducers]			
18	Introduction and Classification of Transducers. Primary and secondary sensing elements	2	CO4
19	Working principle and applications of LVDT, RTD, Thermistor, piezoresistors	3	
20	Inductive transducers, capacitance transducers, Angular movement transducers	2	
21	Feedback transducer system: Inverse transducer, self-balancing transducer Servo-operated manometer , feedback pneumatic load cell , integrating servo	3	

Course Objectives

C.305.1	Identify and classify various types of instruments for power and energy measurement.
C.305.2	Develop the knowledge of working and applications of potentiometers and bridges.
C.305.3	Ability to apply proper recorder and printer in measurement.
C.305.4	Describe working principle selection criteria and application of various transducers in measurement system.

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Microprocessor and Microcontroller (ECC-313)

ACADEMIC PLAN FOR SEMESTER-V 2025-26

S.No.	Topics to be Covered	Lectures	CO	Text/References
UNIT-I	**8085 MICROPROCESSOR**			
1	Evolution of Microprocessor, Block diagram of Microprocessor based system, Introduction to various processors. Architecture and PIN diagram of 8085, Demultiplexing of multiplexed buses, Generation of Control signals.	5	CO1	[T1][R3][R4]
2	Timing Diagram of 8085 Instructions, Instruction Formats and Addressing modes of 8085 Instructions	4	CO1	[T1][R3][R4]
3	Assembly Language Programming	1	CO1	[T1][R3][R4]
4	Interrupts of 8085	1	CO1	[T1][R3][R4]
UNIT-II	**8086 MICROPROCESSOR**			
5	Architecture of 8086 - Detailed description of 8086	2	CO2	[T2][R2][R3][R4]
6	Memory Segmentation of 8086 and its advantages, Physical and Logical address	2	CO2	[T2][R2][R3][R4]
7	Pin configuration of 8086, Minimum and Maximum mode configuration and Bus cycles, Instruction Formats and Constructing the machine codes for 8086.	3	CO2	[T2][R2][R3][R4]

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8	Addressing Modes and Instruction set of 8086, Assembler Directives and Assembly Language Programming.	3	CO2	[T2][R2][R3][R4]
9	Hardware and Software Interrupts of 8086, Interrupt Vector Table	2	CO2	[T2][R2][R3][R4]
10	Memory and IO organization and Interfacing with 8086. Memory mapped IO and IO mapped IO	2	CO2	[T2][R2][R3][R4]
UNIT-III	**PROGRAMMABLE INTERFACE DEVICES**			
11	Introduction to Programmable Peripheral Interface (PPI)-8255, Interfacing Programming of 8255 with 8086, DAC, ADC Interfacing with 8086.	3	CO3	[T1][R4]
12	Introduction to Programmable Interval Timers 8253/8254, Interfacing and Programming of 8253/8254 with 8086.	2	CO3	[T1][R4]
13	Introduction to Interrupt Controller 8259 and its interfacing with 8086, Introduction to USART (8251) and its interfacing with 8086.	3	CO3	[T1][R4]
14	Introduction to Keyboard and Display Interface (8279), and its interfacing with 8086.	2	CO3	[T1][R4]
UNIT-IV	**8051 MICROCONTROLLER**			
15	Introduction to 8051 Microcontroller and Its Architecture, Memory organization. Memory and I/O Interfacing with 8051, Special function registers and Port Operation of 8051.	1	CO4	[T3][R1]
16	Programmer's model of 8051. Operand types. Operand addressing, Data transfer instructions. Arithmetic instructions,	3	CO4	[T3][R1]

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	Logic instructions, Control transfer instructions, Programming of 8051.			
17	Timer & Counter Programming of 8051, Interrupt Programming of 8051.	2	CO4	[T3][R1]

Course Outcomes (COs)

CO Code	Course Outcome Description
CO 1	Ability to understand and distinguish the use of different 8085 instructions, timing diagram, addressing modes, interrupts and apply those instructions for implementing assembly language programs.
CO 2	Ability to analyse the timing diagrams, understand its instruction set, assess its memory organisation and will implement the assembly language programs, interfacing of memory with 8086 successfully.
CO 3	Understand and realize the interfacing of 8255 (PPI), 8254/8253 (PIT), 8251 (USART), 8259 (PIC), 8279 (Keyboard and display), Sample and hold circuit, DAC/ADC, LCD & Stepper motor with 8086 microprocessor.
CO 4	Understand the architecture and operation of 8051 microcontroller and ability to use them for designing various applications based on 8051 by implementing the elaborate instruction set.

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Department of Electronics & Communication Engineering

LESSON PLAN WITH CO MAPPING & GAP ANALYSIS

Cellular and Mobile Communication (ACT-407T) | Semester VII | 42 Lectures

No.	Topic	Lectures	CO	Potential gap
1	Introduction to Cellular Communication Infrastructure and Cells	1	CO1	Limited system-level visualization
2	Clusters and Frequency Reuse Concept	2	CO1	Difficulty visualizing reuse patterns
3	Frequency Reuse Distance Calculation	1	CO1	Numerical practice needed
4	Cell Splitting and Capacity Improvement	1	CO1	Capacity trade-offs need demonstration
5	Cellular System Components and Operations	1	CO1	Architecture needs contextual examples
6	Handoff/Handover	1	CO1	Mobility scenarios need illustration
7	Fixed and Dynamic Channel Assignment	1	CO1	Decision criteria need comparison
8	Co-Channel and Adjacent Channel Interference	1	CO1	Interference mechanisms need visualization
9	Sectorization	1	CO1	Sector patterns need illustration
10	Free Space Propagation Model	1	CO2	Path-loss numericals need practice
11	Propagation Mechanisms: Reflection, Diffraction and Scattering	2	CO2	Propagation effects need visualization
12	Ground Reflection (Two-Ray) Model	1	CO2	Two-ray model interpretation needed
13	Practical Link Budget Using Path Loss Models	2	CO2	Link-budget calculation practice needed
14	Multipath Propagation and Parameters of Mobile Multipath Channels	2	CO2	Multipath parameters need interpretation
15	Types of Small-Scale Fading	1	CO2	Fading types need comparison
16	Fading Due to Multipath Time Delay	2	CO2	Delay Spread

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	Spread and Doppler Spread			calculations need practice
17	GSM Physical Layer: Logical and Physical Channels	2	CO3	Channel classification needs diagrams
18	Frequency and Clock Synchronization	1	CO3	Synchronization process needs animation
19	Adaptive Frame Synchronization	1	CO3	Frame timing needs illustration
20	Mapping Logical Channels onto Physical Channels	1	CO3	Channel mapping needs worked example
21	Radio Subsystem Link Control	1	CO3	Link control needs real examples
22	GSM Protocol Architecture Planes: User and Signaling	2	CO3	Protocol-plane comparison needed
23	Signaling at Um, A and Abis Interfaces	1	CO3	Interface signaling needs flowcharts
24	Signaling at the User Interface	1	CO3	User-interface signaling needs examples
25	GSM Roaming Scenarios and Handover	2	CO4	Roaming sequence needs case study
26	Classical GSM Services, SMS and MMS	2	CO4	Service differences need comparison
27	Improved GSM Data Services: GPRS, HSCSD and EDGE	2	CO4	Data-service evolution needs comparison
28	GPRS System Architecture and Services	1	CO4	GPRS nodes need architecture diagram
29	GPRS Session Management, Mobility Management and Routing	2	CO4	Mobility/session management needs flowchart
30	Introduction to CDMA and CDMA Frequency Bands	1	CO4	CDMA band context needs comparison
31	CDMA Network and System Architecture	1	CO4	CDMA architecture needs illustration

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