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 2021-22 is uploaded on the website of the GGSIPU 'http://www.ipu.ac.in/Pubinfo2022/syllBTechAff130423.pdf'.

2. 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

3. 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

Prof. (Dr.) N. Sharma
Director
MAIT
PSP Area, Sector-22
Rohini, Delhi-110086

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PSP area, Plot No.-1 Sector-22, Rohini, New Delhi – 110085
Ph. No.: 011-27582095, 65151162/63, 65162001
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Department of Electrical & Electronics Engineering

Power Systems-I Theory (EEC212)

Academic Plan for Semester-IV 2024

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

Prof. (Dr.) N. Sharma
Director
MAIT
PSP Area, Sector-22
Rohini, Delhi-110086

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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Website: www.mait.ac.in

Department of Electrical & Electronics Engineering

Introduction to Control system Theory (EEC307)

Academic Plan for Semester-IV 2024

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		1
25	Polar and inverse polar plots		1
26	Concept of stability from Polar plot	CO3	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		1
36	Stability analysis using Routh–Hurwitz criterion		1
37	Nyquist stability criterion	CO4	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.

Prof. (Dr.) N. Sharma
Director
MAIT
PSP Area, Sector-22
Rohini, Delhi-110086

Maharaja Agrasen Institute of Technology

(Approved by AICTE & Affiliated to GGSIP University, New Delhi)
PSP area, Plot No.-1 Sector-22, Rohini, New Delhi – 110085
Ph. No.: 011-27582095, 65151162/63, 65162001
Website: www.mait.ac.in (2024-25 ODD & EVEN SEMESTER)

Department of Electrical & Electronics Engineering

Machine Learning Theory (ML407T)

Academic Plan for Semester-VII 2024

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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Rohini, Delhi-110086

	(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.

Prof. (Dr.) N. Sharma
Director
MAIT
PSP Area, Sector-22
Rohini, Delhi-110086

LECTURE PLAN NEW (2023 onwards)

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

Prof. (Dr.) N. Sharma
Director
MAIT
PSP Area, Sector-22
Rohini, Delhi-110086

Maharaja Agrasen Institute of Technology

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Department of Electrical & Electronics Engineering

Principles of Management for Engineers (MS-302)

ACADEMIC PLAN FOR SEMESTER-VI (2023-24)

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]

Prof. (Dr.) N. Sharma
Director
MAIT
PSP Area, Sector-22
Rohini, Delhi-110086

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

Prof. (Dr.) N. Sharma
Director
MAIT
PSP Area, Sector-22
Rohini, Delhi-110086

Maharaja Agrasen Institute of Technology

(Approved by AICTE & Affiliated to GGSIP University, New Delhi)
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Ph.No. : 011-27582095 , 65151162/63 , 65162001
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Electrical Machine Design Theory (ETEL-405)

ACADEMIC PLAN FOR SEMESTER-VII 2023

S.No.	TOPICS TO BE COVERED	Total No. of Lectures (42)	CO
	UNIT-I (General Concepts & DC Machines)		
1	Major considerations in Design of Electrical Machines Electrical Engineering Materials, Space factor.	2	CO1
2	Choice of Specific Electrical and Magnetic loadings, Thermal considerations, Heat flow, Temperature rise, Rating of machines, Standard specifications.	2	
3	DC Machine Output Equations, Main Dimensions, Magnetic circuit calculations, Carter's Coefficient.	3	
4	Net length of Iron, Real & Apparent flux densities, Selection of number of poles, Design of Armature.	2	
5	Design of commutated and brushes, performance prediction using design values.	2	
	UNIT-II (Transformers)		
7	Output Equations, Main Dimensions.	2	CO2
8	KVA output for single and three phase transformers, Window space factor, Overall dimensions.	2	
9	Operating characteristics, Regulation, No load current.	2	
10	Temperature rise in Transformers, Design of Tank.	3	
11	Methods of cooling of Transformers.	2	
	After Mid Term		
	UNIT-III (Induction Motors)		
13	Output equation of Induction motor,	2	
14	Main dimensions, Length of air gap, Rules for selecting rotor slots of	2	

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	squirrel cage machines.		CO3
15	Design of rotor bars & slots, Design of end rings, Design of wound rotor.	2	
16	Magnetic leakage calculations, leakage reactance of poly phase machines.	2	
17	Magnetizing current, short circuit current, Circle diagram, Operating characteristics.	2	
UNIT-IV (Synchronous Machines:)			
18	Output equations,	2	CO4
19	choice of loadings, Design of salient pole machines, short circuit ratio, shape of pole face, Armature design, Armature parameters,	3	
20	Estimation of air gap length, Design of rotor, Design of damper winding,	2	
21	Determination of full load field mmf, Design of field winding, Design of turbo alternators, Rotor design	3	

Course Outcomes

C.406.1	Design of various components of dc machine.
C.406.2	Design of different components of transformer.
C.406.3	Design of different components of induction motor.
C.406.4	Design of different components of synchronous machine.

Prof. (Dr.) N. Sharma
Director
MAIT
PSP Area, Sector-22
Rohini, Delhi-110086

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PSP area, Plot No.-1 Sector-22, Rohini, New Delhi – 110085
Ph.No. : 011-27582095 , 65151162/63 , 65162001
Website: www.mait.ac.in

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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Utilization of Electrical Energy (EEE-320T)

ACADEMIC PLAN FOR SEMESTER-VI EEE

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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Network Analysis and synthesis Theory (EEC206)

ACADEMIC PLAN FOR SEMESTER-IV Jan-2024

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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Statistics, Statistical Modelling & Data Analytics (DA-304T)
ACADEMIC PLAN FOR SEMESTER-VI (A.Y. 2023-24)

S.No.	TOPICS TO BE COVERED	Total No. of Lectures (41)	CO
	UNIT-I(Statistics)		
1	Statistics (Definitions, importance, types of data: qualitative vs. quantitative), Measures of Central Tendency: Mean, Median, and Mode	2	CO1
2	Measures of Dispersion: Range, Variance, and Standard Deviation (Calculation, interpretation, sample vs. population variance), Data Visualization: Graphs and Charts (Bar charts, histograms, pie charts, box plots, Scatter plots, heatmaps, advanced visualization tools)	2	
3	Probability Distributions (binomial, Poisson, normal), Basics of Hypothesis Testing (Null and alternative hypotheses, Type I and II errors)	2	
4	t-Tests and Chi-Square Tests (One-sample, two-sample, paired t-tests, Chi-square tests for goodness-of-fit and independence)	1	
5	Basics of Linear Algebra (Vectors, matrices, basic operations), Matrix Decompositions and Eigenvalues (LU decomposition, eigenvalues, eigenvectors)	2	
6	Population and Sample Statistics (Parameters vs. statistics, sampling methods, measures of central tendency and dispersion), Sampling Distributions and the Central Limit Theorem (Distribution of sample mean, significance of the central limit theorem)	2	
7	Confidence Intervals and Point Estimation (Calculation, interpretation, properties of estimators), Quantitative Analysis and Regression Techniques (Correlation, simple and multiple regression, interpretation of coefficients)	2	
	UNIT-II (Statistical Modelling)		
8	Statistical models, linear models, and regression analysis, Simple linear regression: assumptions, OLS estimation, and coefficient interpretation.	2	CO2
9	Multiple linear regression: assumptions, diagnostics, and coefficient interpretation, Gauss-Markov theorem: statement, proof, and applications.	2	
10	Geometry of least squares: geometric interpretation, subspace formulation, and orthogonal projections, Analysis of variance (ANOVA): one-way ANOVA, assumptions, computations, and interpretation.	2	

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11	Regression diagnostics: residual analysis, detecting outliers and influential points, and influence diagnostics. Transformations and Box-Cox models: purpose, common transformations, and Box-Cox estimation and interpretation.	2	CO2
12	Model selection and building strategies: criteria (AIC, BIC), stepwise regression, and cross-validation, Logistic regression models: introduction, maximum likelihood estimation, and coefficient interpretation.	2	
13	Poisson regression models: application for count data, assumptions, estimation, and interpretation.	1	
After Mid Term			
UNIT-III(Data Analytics)			
14	Introduction to open and closed sets: definitions, examples, and properties.	1	CO3
15	Compactness: concepts, Heine-Borel theorem, and applications.	1	
16	Metric spaces and metric in $\mathbb{R}n$: definitions, properties, and common metrics.	1	
17	Cauchy sequences and completeness: definitions, properties, and examples.	1	
18	Compactness in metric spaces: relationships, sequential compactness, and applications. Connectedness in metric spaces: definitions, properties, and applications.	2	
UNIT-IV(Advanced concepts in Data Analytics)			
19	Introduction to vector spaces: definitions, examples, and properties, Subspaces: definitions, properties, and examples.	2	CO4
20	Independence of vectors: definitions, determination methods, and applications, Basis and dimension: definitions, finding basis, calculating dimension, and applications.	2	
21	Introduction to eigenvalues and eigenvectors: definitions, significance, and calculation methods, Properties and computation of eigenvalues and eigenvectors: techniques and applications in PCA.	2	
22	Advanced topics in eigenvalues and eigenvectors: diagonalization, spectral decomposition, and applications.	1	

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Course Outcomes.

C. DA-304T.1	Ability to learn and understand the basic concepts about Statistics, visualisation and probability.
C. DA-304T.2	Ability to implement regression analysis and interpret the results. Be able to fit a model to data and comment on the adequacy of the model.
C. DA-304T.3	Ability to describe classes of open and closed sets of R, concept of compactness Describe Metric space - Metric in R^n.
C. DA-304T.4	Ability to impart basic knowledge about how to apply Eigenvalues, Eigenvectors.

Prof. (Dr.) N. Sharma
Director
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