



Yashoda Shikshan Prasarak Mandal's
YASHODA TECHNICAL CAMPUS, SATARA
 An Autonomous Institute
FACULTY OF ENGINEERING
Department of Electrical Engineering

Curriculum Structure- Working Professional
S.Y. B.Tech SEMESTER III

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					TOTAL
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.	Min. Passing	
0UEWPC301	F	Applied Mathematics for Electrical Engineering	3	1	0	5	4	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC302	F	Electrical Measurements and Instrumentation	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC303	F	Network Analysis	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC304	F	Electrical Engineering Material	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC305	F	Analog & Digital Electronics	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWVE306	F	Environmental Studies	2	0	0	1	2	ISE	50	20*	-	-	50
0UEWHM307	F,E	Engineering Economics	2	0	0	1	2	ISE	50	20*	-	-	50
0UEWPC308	F,E	Electrical Measurements and Instrumentation Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWPC309	F	Network Analysis Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWPC310	F	Analog & Digital Electronics Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWVS311	F	MATLAB for Electrical Engineering Lab	0	0	2	1	1	ISE	-	-	50	25**	50
TOTAL			19	1	08	27	24	TOTAL MARKS					800
Total Contact Hours Per Week			28										

Course Category	Program Core Course	Program Elective Course	Open Elective Course	Multi Disciplinary Minor Course	Value Education	Vocational and Skill Enhancement Course	Ability Enhancement Course	Humanities and Management Course	Internship	Project	Co-curricular Courses	Total
	PC	PE	OE	MD	VE	VS	AE	HM	IR	PR	CC	
Credit	19	-	-	-	2	1	-	2	-	-	-	24

ISE :-In semester evaluation , MSE: - Mid Semester Examination, ESE: - End Semester Examination

Note-1 * - Scoring 40% in ESE is essential and combining ISE+MSE+ESE=40% for theory course

** - ISE-40%, ESE-50% and Combined together needs to be 50% for Lab courses

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FACULTY OF ENGINEERING
Department of Electrical Engineering

Curriculum Structure- Working Professional
S.Y. B.Tech SEMESTER IV

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					Total
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.	Min. Passing	
0UEWPC401	F	Electrical Machines I	3	-	-	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC402	F	Power Systems I	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC403	F	Electromagnetics Engineering	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC404	F	Renewable Energy Sources	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWMD405	F	MDM I	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWVE406	F,E	Universal Human Values	2	0	0	3	2	ISE	50	20*	-	-	50
0UEWHM407	F,E	Entrepreneurship Development	2	0	0	3	2	ISE	50	20*	-	-	50
0UEWPC408	F	Electrical Machines I Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWPC409	F	Power Systems I Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWAE410	F,E	Electrical Planning Lab	0	0	2	1	1	ISE	-	-	50	25**	50
0UEWIR411	F,E	Internship-I	0	0	0	2	2	ISE	-	-	50	25**	50
TOTAL			19	0	6	31	24	TOTAL MARKS					800
Total Contact Hours Per Week			25										

Course Category	Program me Core Course	Programme Elective Course	Open Elective Course	Multi Disciplinary Minor Course	Value Education	Vocational and Skill Enhancement Course	Ability Enhancement Course	Humanities and Management Course	Internship	Project	Co-curricular Courses	Total
	PC	PE	OE	MD	VE	VS	AE	HM	IR	PR	CC	
Credit	14	-	-	3	2	-	1	2	2	-	-	24

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Note- 1 * - Scoring 40% in ESE is essential and combining ISE+MSE+ESE=40% for theory course

** - ISE-40%, ESE-50% and Combined together needs to be 50% for Lab courses

Note-2- Internship I: Students are expected to complete 60 hours of internship after the Third Semester, and its evaluation will be conducted in the Fourth Semester.

Total Credit in SY

SEM-I	SEM-II	SEM-III	SEM-IV	TOTAL
22	22	24	24	92

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FACULTY OF ENGINEERING
Department of Electrical Engineering

Curriculum Structure- Working Professional
T.Y. B.Tech SEMESTER V

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					TOTAL
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.	Min. Passing	
0UEWPC501	F	Power System II	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC502	F	Electrical Machine-II	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPE503	F	PEC I	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWOE504	F	OE I (MOOC)	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWMD505	F	MDM II	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWVE506	F,E	Constitution of India	2	0	0	3	2	ISE	50	20*	-	-	50
0UEWPC507	F,E	Power Systems II Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWPC508	F	Electrical Machine-II Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWVS509	F	Microprocessor & Controller Lab	0	0	2	1	1	ISE	-	-	50	25**	50
0UEWAE510	F	Electrical Installation and Estimation	2	0	0	3	2	ISE	50	20*	-	-	50
0UEWPR511	F,E	Mini Project	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWCC512	F	Co –curricular Courses	0	0	2	1	1	ISE	-	-	50	25**	50
TOTAL			17	0	10	31	24	TOTAL MARKS					850
Total Contact Hours Per Week			27										

Course Category	Programme Core Course	Programme Elective Course	Open Elective Course	Multi Disciplinary Minor Course	Value Education	Vocational and Skill Enhancement Course	Ability Enhancement Course	Humanities and Management Course	Internship	Project	Co – curricular Courses	Total
	PC	PE	OE	MD	VE	VS	AE	HM	IR	PR	CC	
Credit	8	3	3	3	2	1	2	-	-	1	1	24

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Note-1 * - Scoring 40% in ESE is essential and combining ISE+MSE+ESE=40% for theory course

** - ISE-40%, ESE-50% and Combined together needs to be 50% for Lab courses



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FACULTY OF ENGINEERING
Department of Electrical Engineering

Curriculum Structure- Working Professional
T.Y. B.Tech SEMESTER VI

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					Total
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.	Min. Passing	
0UEWPC601	F	Control Systems	3	0	-	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC602	F	Power Electronics	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPE603	F	PEC II	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPE604	F	PEC III	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWOE605	F	OE II (MOOC)	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWMD606	F	MDM III	2	0	0	3	2	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWVS607	F,E	EV Lab/ PLC & SCADA Lab	0	0	2	1	1	ISE	-	-	50	25**	50
0UEWPC608	F	Control Systems Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWPC609	F	Power Electronics Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWPR610	F,E	Project Phase- I	0	0	4	3	2	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWIR611	F,E	Internship-II	0	0	0	3	2	ISE	-	-	50	25**	50
TOTAL			17	0	10	32	24	TOTAL MARKS					850
Total Contact Hours Per Week			27										

Course Category	Programme Core Course	Programme Elective Course	Open Elective Course	Multi Disciplinary Minor Course	Value Education	Vocational and Skill Enhancement Course	Ability Enhancement Course	Humanities and Management Course	Internship	Project	Co - curricular Courses	Total
	PC	PE	OE	MD	VE	VS	AE	HM	IR	PR	CC	
Credit	8	6	3	2	-	1	-	-	2	2	-	24

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Note- 1 * - Scoring 40% in ESE is essential and combining ISE+MSE+ESE=40% for theory course

** - ISE-40%, ESE-50% and Combined together needs to be 50% for Lab courses

Note- 2 Internship II: Students are expected to complete 60 hours of internship after the Fifth Semester, and its evaluation will be conducted in the Sixth Semester.

Total Credit in TY

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI	TOTAL
22	22	24	24	24	24	140

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FACULTY OF ENGINEERING
Department of Electrical Engineering

Curriculum Structure- Working Professional
B.Tech SEMESTER VII

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					TOTAL
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.	Min. Passing	
0UEWPC701	F	Switchgear & Protection	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC702	F	Electrical Drives & Control	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPE703	F	PEC IV	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPE704	F	PEC V	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWMD705	F	MDM IV	3	0	0	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWPC706	F,E	Switchgear & Protection Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWPC707	F,E	Electrical Drives & Control Lab	0	0	2	1	1	ISE	-	-	25	25**	50
								ESE	-	-	25		
0UEWPR708	F,E	Project Phase- II	0	0	8	5	4	ISE	-	-	50	50**	100
								ESE	-	-	50		
0UEWCC709	F,E	Co –curricular Courses	0	0	2	1	1	ISE	-	-	50	25**	50
TOTAL			15	0	14	28	22	TOTAL MARKS					750
Total Contact Hours Per Week			29										

Course Category	Programme Core Course	Programme Elective Course	Open Elective Course	Multi Disciplinary Minor Course	Value Education	Vocational and Skill Enhancement Course	Ability Enhancement Course	Humanities and Management Course	Internship	Project	Co – curricular Courses	Total
	PC	PE	OE	MD	VE	VS	AE	HM	IR	PR	CC	
Credit	8	6	-	3	-	-	-	-	-	4	1	22

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FACULTY OF ENGINEERING
Department of Electrical Engineering

Curriculum Structure- Working Professional
B.Tech SEMESTER VIII

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme				Total	
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.		Min. Passing
0UEWPE801	F	PEC VI (MOOC)	2	-	-	4	3	ISE	20	40*	-	-	100
								MSE	20				
								ESE	60				
0UEWIR802	F,E	Internship- III	-	-	2	16	8	ISE	-	-	100	100**	200
								ESE			100		
TOTAL			02	0	02	20	11	TOTAL MARKS					300
Total Contact Hours Per Week			04										

Course Category	Programme Core Course	Programme Elective Course	Open Elective Course	Multi Disciplinary Minor Course	Value Education	Vocational and Skill Enhancement Course	Ability Enhancement Course	Humanities and Management Course	Internship	Project	Co-curricular Courses	Total
	PC	PE	OE	MD	VE	VS	AE	HM	IR	PR	CC	
Credit	-	3	-	-	-	-	-	-	8	-	-	11

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Note- 1 * - Scoring 40% in ESE is essential and combining ISE+MSE+ESE=40% for theory course

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Note- 2 Internship III: Students are expected to complete a minimum of 240 hours of internship during the Eighth Semester, and the internship will be evaluated in the Eighth Semester.

Total Credit in BTech

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI	SEM-VII	SEM-VIII	TOTAL
22	22	24	24	24	24	22	11	173

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Program Elective –I

Sr. No.	Track	Course Code	Course Name
1	Power and Grid Systems	0UEWPE403 A	Electrical Power Utilization
2	Renewable and Sustainable Energy	0UEWPE403 B	Solar & Wind Energy

Program Elective –II

Sr. No.	Track	Course Code	Course Name
1	Power and Grid Systems	0UEWPE503 A	HVDC Technology
2	Renewable and Sustainable Energy	0UEWPE503 B	Grid Integration Renewable Energy Sources

Program Elective –III

Sr. No.	Track	Course Code	Course Name
1	Power and Grid Systems	0UEWPE603 A	Smart Grid Technology
2	Renewable and Sustainable Energy	0UEWPE603 B	Energy Audit & Management

Program Elective –IV

Sr. No.	Track	Course Code	Course Name
1	Electric Vehicle	0UEWPE703 A	Electric & Hybrid Vehicle
2	Industrial Automation	0UEWPE703 B	PLC and SCADA Systems

Program Elective –V

Sr. No.	Track	Course Code	Course Name
1	Electric Vehicle	0UEWPE802 A	Energy Storage System
2	Industrial Automation	0UEWPE802 B	Robotics and Automation

Program Elective –VI

Sr. No.	Track	Course Code	Course Name
1	Electric Vehicle	0UEWPE803 A	EV Charging Infrastructure
2	Industrial Automation	0UEWPE803 B	Industry 4.0 Technologies


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Multi Deciplinary Minor

Sr. No.	Semester	MDM	Course Code	Course Name	Credit
1	IV	MDM I	0UEWMD405	Renewable Energy sources	3
2	V	MDM II	0UEWMD505	Electric and Hybrid Vehicle	3
3	VI	MDM III	0UEWMD606	Energy storage technology	2
4	VII	MDM IV	0UEWMD705	Industrial Automation PLC & SCADA	3
Total Credits					11




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List of NPTEL Courses in Open Electives

Sr. No.	Term	Discipline	Course Name	WEEK	Link
1.	I	Economics	Economic Environment and Business Strategy	8 Weeks	https://onlinecourses.nptel.ac.in/noc25_ec16/preview
2.		Multidisciplinary	Intellectual Property Portfolio Management	8 Weeks	https://onlinecourses.nptel.ac.in/noc25_ge51/preview
3.		Humanities and Social Science	Soft Skill Development	8 Weeks	https://onlinecourses.nptel.ac.in/noc25_hs142/preview
4.		Multidisciplinary	Research Methodology	8 Weeks	https://onlinecourses.nptel.ac.in/noc25_ge66/preview
5.		Management	Patent Search for Engineers and Lawyers	8 Weeks	https://onlinecourses.nptel.ac.in/noc25_mg143/preview
6.		Humanities and Social Science	Energy Economics and Policy	8 Weeks	https://onlinecourses.nptel.ac.in/noc25_hs136/preview
7.		Humanities and Social Science	Developing Soft Skills and Personality	8 Weeks	https://onlinecourses.nptel.ac.in/noc25_hs174/preview
8.		Management	Marketing Management - I	8 Weeks	https://onlinecourses.nptel.ac.in/noc25_mg115/preview
9.	II	Management	Yoga and Positive Psychology for Managing Career and Life	8 Weeks	https://onlinecourses.nptel.ac.in/noc26_mg14/preview
10.		Management	Ethics in Engineering Practice	8 Weeks	https://onlinecourses.nptel.ac.in/noc26_mg42/preview
11.		Humanities and Social Sciences	Introduction to Psychology	8 Weeks	https://onlinecourses.nptel.ac.in/noc26_hs42/preview
12.		Humanities and Social Sciences	Modernisation and Creative Communication	8 Weeks	https://onlinecourses.nptel.ac.in/noc26_hs50/preview
13.		Multidisciplinary	Roadmap for Patent Creation	8 Weeks	https://onlinecourses.nptel.ac.in/noc26_ge18/preview
14.		Humanities and Social Sciences	Introduction on Intellectual Property to Engineers and Technologists	8 Weeks	https://onlinecourses.nptel.ac.in/noc26_hs62/preview
15.		Multidisciplinary	Industry 4.0: Managing The Digital Transformation	8 Weeks	https://onlinecourses.nptel.ac.in/noc26_ge04/preview
16.		Management	Business Development: From Start to Scale	8 Weeks	https://onlinecourses.nptel.ac.in/noc26_mg50/preview

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Course Structure:

Class	S.Y.B. Tech. Sem. –III
Course Code and Course Title	0UEWPC301, Applied Mathematics for Electrical Engineering
Prerequisite/s	Derivative & Integration
Teaching Scheme: Lecture/Tutorial/Practical	03/01/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC301_1	Apply the concepts and properties of complex numbers, to solve mathematical problems.	L3
0UEWPC301_2	Analyze functions using the properties of Laplace transforms.	L4
0UEWPC301_3	Differentiate appropriate inverse Laplace transform techniques, for solving linear and simultaneous linear differential equations with constant coefficients.	L4
0UEWPC301_4	Examine Fourier transforms, their properties, and related theorems for solving engineering problems.	L4
0UEWPC301_5	Implement numerical methods to obtain approximate solutions of engineering problems.	L3
0UEWPC301_6	Examine scalar and vector fields using differential operators and integral theorems in engineering applications.	L4

Course Contents:

Unit 1	Laplace Transform: Definition – conditions for existence ;Transforms of elementary functions; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n , change of scale property, transforms of functions divided by t , transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function	7Hrs.
Unit 2	Inverse Laplace Transform: Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equation and simultaneous linear differential equations with constant coefficients	7Hrs.


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Unit 3	Complex Number: Introductory remarks, definition and geometrical representation of complex number, polar form & exponential form of complex number, properties of complex number, De-Moivre's theorem & its applications, Circular function of complex variable : Definition, Hyperbolic functions, Relations between circular & hyperbolic function, Logarithm of complex quantities	7Hrs.
Unit 4	Fourier Transform: Definitions – integral transforms; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.	7Hrs.
Unit 5	Numerical Methods-I: Introduction, Euler's method, Euler's modified method, Gauss-Seidel iterative method, Newton-Raphson Method.	7Hrs.
Unit 6	Vector Calculus: Scalar and vector introduction, Scalar and vector fields, Gradient, divergence and curl of a vector, Solenoidal and irrotational vector fields; Vector identities (statement without proofs); Gauss's divergence theorem and Stokes theorem (without proofs).	7Hrs.
Total Hours		42 Hrs.

Text Books:

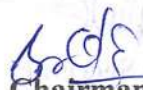
Sr. No	Title	Author	Publisher
1	Higher Engineering Mathematics	B. S. Grewal	Khanna Publisher
2	Advanced Engineering Mathematics	H. K. Dass	S. Chand & Company Limited
3	Numerical Methods	E. Balagurusamy	Tata McGraw Hill Publications
4	Numerical Methods for Engineers	Steven C. Chapra, Reymond P. Canale	Tata McGraw Hill Publications

Reference Books:

Sr. No.	Title	Author	Publisher
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons, New York.
2	A Text Book of Applied Mathematics (Vol I & II)	P. N. Wartikar and J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune.
3	Higher Engineering Mathematics	B. V. Ramana	Tata McGraw-Hill Publications, New Delhi.
4	Introductory Methods of Numerical Methods	S. S. Sastri	Prentice Hall of India, New Delhi


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E- Learning Resources:

Sr. No.	Title	Course Instructor	Platform	Web link
1	Introduction to Methods of Applied Mathematics	Prof. Mani Mehra, Prof. Vivek K. Aggarwal	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma108
2	Calculus of Several Real Variables	Prof. Joydeep Dutta	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma92



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Department of Electrical Engineering

Course Structure:

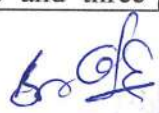
Class	S.Y. B. Tech. Sem. –III
Course Code and Course Title	0UEWPC302, Electrical Measurements and Instrumentation
Prerequisite/s	Basic Electrical Engineering
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC302_1	Apply the concepts of analog and digital measuring instruments to explain their classification, construction, working, and range extension techniques.	L3
0UEWPC302_2	Derive the equations of different methods for measurement of resistance, inductance, and capacitance.	L3
0UEWPC302_3	Apply the operating principles of different transducers to explain their construction and operation.	L3
0UEWPC302_4	Use various analyzers and modern measurement techniques for electrical measurements.	L3
0UEWPC302_5	Solve numerical problems related to Electrical Measurement and Instrumentation using appropriate measurement principles.	L3

Course Contents:		
Unit 1	Principles of Analog Measuring Instruments Measurements, Significance of Measurements, Methods of Measurements, Classification of Measuring instruments, static and dynamic characteristics of measuring Instruments, Standards and their classification, Errors and their types, Analog Instruments – Permanent magnet moving coil instrument (PMMC), Moving Iron instruments, Electrodynamometer type instruments, Extension of range by using shunt multiplier. (Numerical expected).	8 Hrs.
Unit 2	Measurement of Resistance, Inductance & Capacitance Measurement of low, medium and high resistance: Ammeter-voltmeter method, Wheatstone bridge, Kelvin's double bridge, Megger, Earth tester for earth resistance measurement. Maxwell's Inductance bridge, Maxwell's Inductance & Capacitance Bridge, Hay's bridge, Anderson's bridge, Owen's bridge, De Sauty's Bridge, Schering Bridge. (Numerical expected on bridges).	8 Hrs.
Unit 3	Measurement of Energy and Power Dynamometer wattmeter, Power measurement in single phase circuit, active power measurement in three phase circuit using one and two and three	8 Hrs.


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Department of Electrical Engineering

	wattmeter method, Measurement of Reactive Power by using one wattmeter method. Instrument Transformer - Construction, working & applications of current transformer and potential transformer, Measurement of power by using instrument transformer. Construction and working principle of single phase and three phase energy meters, Error and their compensation. (Numerical expected)	
Unit 4	Principles of Digital Measuring Instruments: Advantages of digital meters over analogue meters. Resolution & sensitivity of digital meters. Working principles of digital Voltmeter, Ammeter, Energy Meter, Multimeter, Construction and working principle of CRO, measurement of voltage, current, period and frequency by CRO. Phase angle & frequency by Lissajous pattern & numerical. Construction and working principle of DSO, advantages and disadvantages of DSO over CRO.	7 Hrs.
Unit 5	Transducers: Transducers: Introduction, classification of transducers. construction, working, application of: Electrical transducer, Resistive transducer, Resistive Potentiometer, Strain Guage, Thermistor, RTD, Thermocouples, LVDT and RVDT, capacitive transducer, Piezoelectric Transducers, Hall effect transducers.	7 Hrs.
Unit 6	Recent Developments in Measurements and Instrumentation: Smart Energy Metering and Advanced Metering Infrastructure (AMI), Digital Power Analyzer, Smart Sensors, Hall Effect Current Sensors, Fiber Optic Sensors, Optical Encoders, Current Clamp Sensors, Wireless Sensors, Virtual Instrumentation and Data Acquisition Systems, applications in Smart Grid, Electric Vehicles, Industrial Automation and IoT.	4 Hrs.
Total Hours		42 Hrs.

Text Books

Sr. No	Title	Author	Publisher
1	A Course in Electrical and Electronic Measurements & Instrumentation	A. K. Sawhney	Dhanpat Rai & Co.
2	A Course in Electronics & Electrical Measurements & Instrumentation	J. B. Gupta	S. K. Kataria & Sons
3	Electrical Measurement & Instrumentation	U. A. Bakshi, V. A. Bakshi	Technical Publication
4	Electronic Instrumentation	H. S. Kalsi	Tata McGraw Hill


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Reference Books

Sr. No.	Title	Author	Publisher
1	Electrical Measurements & Measuring Instruments	E. W. Golding, F. C. Widdis	Reem Publications
2	Electronic Measurements & Instrumentation	Oliver, B. M. Cage, J. M.	MC GRAW
3	Electrical Measurement & Instrumentation	R. S. Sirohi, Radhakrishnan	New Age International
4.	Instrumentation Measurement and Analysis	B. C. Nakra, K. K. Chaudhari	Tata McGraw Hill

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Electrical Measurement and Electronic Instruments	By Prof. Avishek Chatterjee	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ee171


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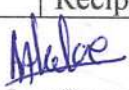
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Course Structure:

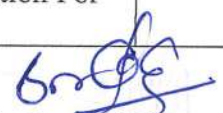
Class	S.Y.B. Tech. Sem. –III
Course Code and Course Title	0UEWPC303, Network Analysis
Prerequisite/s	Basic Electrical Engineering.
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE / MSE /ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC303_1	Apply the concept of node, mesh, and network topology to solve electrical networks	L3
0UEWPC303_2	Apply network theorems to solve electrical circuits.	L3
0UEWPC303_3	Determine transient responses of RLC series and parallel circuits using initial & final conditions.	L4
0UEWPC303_4	Examine the characteristics of resonant and coupled circuits using self and mutual inductance, coefficient of coupling, dot convention, and single-tuned circuits.	L4
0UEWPC303_5	Apply Laplace's Transform method to solve electrical circuit.	L3
0UEWPC303_6	Analyze two-port networks using Z, Y, ABCD, h, and g parameters.	L4

Course Contents:		
Unit 1	Network Analysis Techniques: Star-Delta Conversion, Source Transformation, Mesh & Node Analysis for DC & AC circuit, Concept Duality.	8 Hrs.
Unit 2	Network theorem for DC & AC circuits: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem. Tellegen's theorem, Millman's theorem	8 Hrs.
Unit 3	Transient Response Analysis: Evaluation of initial & Final condition, Transient response of RL, RC & RLC series circuit. Transient response of RL, RC & RLC parallel circuit.	8 Hrs.
Unit 4	Resonance And Coupled Circuits: Resonance: Series and parallel resonance - Resonant frequency, Bandwidth, and Quality factor at resonance. Coupled Circuits: Self and mutual inductance - Coefficient of coupling - Dot rule- Single Tuned circuits.	6 Hrs.
Unit 5	Two port Network: Terminals & terminal pairs, Impedance Parameters, Admittance Parameters, Transmission Parameters (ABCD), Hybrid Parameters (h, g), Condition For Reciprocity And Symmetry for every parameters.	6 Hrs.


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Unit 6	Application of Laplace's Transform: Standard test input signal- Unit step, Impulse & ramp functions and their Laplace transform, Solution of differential equation using Laplace transform, solve of R-L, R-C, R-L-C circuits using Laplace transform, Transient and steady state response of RL and RC circuit to various functions using Laplace transform	6 Hrs.
Total Hours		42 Hrs.

Text Books

Sr. No	Title	Author	Publisher
1	Fundamentals of Electric Circuits	Alexander, C. A. / Sadiku, M. N. O.	Tata McGraw-Hill
2	Fundamental Of Network Analysis & Synthesis	Peikari, B.	Jaico Book
3	Network Analysis	Mithal, G. K.	Khanna Pub.
4	Network Analysis And Synthesis	Harlapur, V. K. / Shingare, D. Y	Electrotech Publication

Reference Books

Sr. No.	Title	Author	Publisher
1	Network Analysis	Valkenburg, V. M. E.	PHI
2	Engineering Circuit Analysis	Hayt, W. H. / Buck, J. A.	MC GRAW
3	Introductory Circuit Analysis	Bovlestrad, R. L.	Pearson
4	A Course In Electrical Circuit Analysis	Soni, M. L.	Dhanpat Rai & com.

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Network Analysis	Prof. Tapas Kumar Bhattacharya	NPTEL	https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ee14

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Department of Electrical Engineering

Course Structure:

Class	S.Y. B. Tech. Sem. –III
Course Code and Course Title	0UEWPC304_Electrical Engineering Material
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE/MSE/ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC304_1	Apply the concepts of crystal structures to identify and analyze different types of unit cells, lattice systems, and crystal arrangements.	L3
0UEWPC304_2	Apply magnetic theories to classify materials and calculate hysteresis losses.	L3
0UEWPC304_3	Analyze electronic behavior of conductors and superconducting phenomena.	L4
0UEWPC304_4	Analyze semiconductor properties, carrier behavior, and device applications.	L4
0UEWPC304_5	Analyze polarization mechanisms and dielectric properties of materials.	L4
0UEWPC304_6	Analyze nanomaterial properties using suitable characterization techniques.	L4

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
Unit 1	Crystallography: Crystal directions and planes, Diatomic Crystal (CsCl, NaCl, Diamond, BaTiO ₃) Crystal imperfection, Point defects, Line defects, Surface and Volume defects, Structure properties relationship, structure determination by X-ray diffraction.	8 Hrs.
Unit 2	Magnetic Materials: Origin of magnetization using atomic theory, classification of magnetic materials and properties, Langevin's theory of Dia, Para and ferromagnetism, Soft and Hard magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Antiferromagnetic and Ferrimagnetic materials, Ferrites and Garnets, magnetic bubbles, magnetic recording.	6 Hrs.
Unit 3	Conducting and Superconducting Materials: Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors (Cryotron, magnetic levitation)	8 Hrs.


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Unit 4	Semiconducting Materials: Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell	8 Hrs.
Unit 5	Dielectric Materials: Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss	6 Hrs.
Unit 6	Nano Materials : Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials.	6 Hrs.
Total Hours		42 Hrs.

Text Books

Sr. No	Title	Author	Publisher
1	Material Science and Engineering	V. Raghavan	PHI learning Pvt Ltd
2	Electrical Engineering Materials	A.J. Dekker	Prentice Hall, Englewood Cliffs, N.J.

Reference Books

Sr. No.	Title	Author	Publisher
1	Solid State Physics	A.J. Dekker	Laxmi Publications
2	Science of Engineering Materials and Carbon Nanotubes	C.M. Srivastava and C. Srinivasan	New Academic Science Ltd

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Material Science and Engineering	Dr. Vivek Pancholi	NPTEL/ Swayam	https://www.youtube.com/watch?v=5nBBUahtz-c&list=PLyAZSyX8Qy5C8ciqBBlypbx91j4nowUbl


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Course Structure:

Class	Second Year B. Tech. Sem. -III
Course Code and Course Title	0UEWPC305, Analog & Digital Electronics
Prerequisite/s	Basic Electronics Engineering
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC305_1	Analyze semiconductor devices, rectifiers, and transistor circuits	L4
0UEWPC305_2	Analyze transistor and Op-Amp-based analog circuits	L4
0UEWPC305_3	Analyze and design combinational digital logic circuits	L4
0UEWPC305_4	Evaluate and design sequential circuits, logic families, and data converters	L5

Course Contents:		
Unit 1	Introduction to Semiconductor Devices and Transistor: PN junction diode V-I characteristics of diode, Static and dynamic resistance, Temperature characteristics, Zener diode and voltage regulation, Rectifiers, Half-wave rectifier, Full-wave rectifier, Ripple factor and efficiency, Capacitor filter, Clippers and clampers, BJT construction and operation, Input and output characteristics of CB, CE and CC configurations, DC load line, Operating point and bias stabilization, Thermal runaway	6 Hrs.
Unit 2	Transistor Amplifiers and Feedback Amplifiers: Small signal analysis of CB, CC, CE amplifier, h-parameter equivalent circuits, Voltage gain, Current gain, Input and output impedance, RC coupled amplifier, Frequency response, Lower and upper cutoff frequencies, Bandwidth, Classification of amplifiers	8 Hrs.
Unit 3	Operational Amplifiers and Analog Applications: Differential amplifier as input stage, Block diagram of IC 741, Ideal and practical Op-Amp, Op-Amp parameters, Input offset voltage, Input bias current, Slew rate, CMRR, PSRR, Gain-bandwidth product, Inverting amplifier, Non-inverting amplifier, Applications of Op-Amp	7 Hrs.
Unit 4	Digital Electronics Fundamentals: Digital number systems, Number system conversions, Binary arithmetic, 1's complement, 2's complement, BCD code, Gray code, Excess-3 code, ASCII code, Error detecting codes, Boolean algebra, Boolean identities	7 Hrs.


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	De Morgan's theorem, Canonical SOP and POS forms, Karnaugh maps (up to 5 variables), Logic gate realisation, Universal gates	
Unit 5	Combinational and Sequential Logic Circuits: Adder & Subtractor circuits, Magnitude comparator, Encoder, Decoder, Multiplexer, Demultiplexer Sequential Circuits: Latches, SR flip-flop, JK flip-flop, D flip-flop, T flip-flop, race-around condition, Master-slave flip-flop, Registers, Shift registers Counters, Sequence generator	7 Hrs.
Unit 6	Logic Families, Data Converters: Logic Families: RTL, DTL, TTL, ECL, CMOS, Characteristics of logic families, Noise margin, Fan-in, Fan-out, Propagation delay, Power dissipation, Speed-power product Data Converters: Digital-to-Analog Converter (DAC), Binary weighted resistor DAC, R-2R ladder DAC, Analog-to-Digital Converter (ADC), Flash ADC, Counter type ADC, Successive approximation ADC, Dual slope ADC	7 Hrs.
Total Hours		42 Hrs.

Text Books

Sr. No	Title	Author	Publisher
1	Principles of Electronics	Mehta, V. K., and Mehta, R.	S Chand
2	Electronic Devices and Circuit Theory	Robert L. Boylestad and Louis Nashelsky	Pearson Education
3	Digital Design	M. Morris Mano and Michael D. Ciletti	Pearson Education
4	Op-Amps and Linear Integrated Circuits	Ramakant A. Gayakwad	Pearson Education

Reference Books

Sr. No.	Title	Author	Publisher
1	Electronic Circuit Analysis and Design	Donald A. Neamen	McGraw-Hill Education
2	Integrated Electronics: Analog and Digital Circuits and Systems	Jacob Millman and Christos C. Halkias	McGraw-Hill Education
3	Modern Digital Electronics	R. P. Jain	McGraw-Hill Education (India)
4.	Fundamentals of Digital Circuits	A. Anand Kumar	PHI Learning Pvt. Ltd.


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Department of Electrical Engineering

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Digital Electronic Circuits	Prof. Goutam Saha	NPTEL/ Swayam	nptel.ac.in/courses/108105132
2	Analog Electronic Circuits	Prof. Pradip Mandal	NPTEL/ Swayam	nptel.ac.in/courses/108105158

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**Course Structure:**

Class	S.Y.B. Tech. Sem. –III
Course Code and Course Title	0UMWVE306, Environmental Studies
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	02/00/00
Credits	02
Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	Bloom's Level
0UMWVE306_1 Demonstrate the concepts of natural resources, ecosystems, and biodiversity in addressing environmental issues across disciplines.	L3
0UMWVE306_2 Implement knowledge of causes, effects, and control measures of pollution to develop suitable mitigation strategies.	L3
0UMWVE306_3 Examine environmental ethics and their role in resolving societal and ecological challenges.	L4
0UMWVE306_4 Assess environmental laws and regulations for their effectiveness in societal and industrial contexts.	L4

Course Contents :		
Unit 1	Fundamentals of Environmental Studies: Environmental Studies Basics: Definition, scope, and importance, Multidisciplinary nature. Ecosystem: Concept, structure, and functions; Producers, consumers, decomposers; Energy flow in ecosystem; Ecological succession. Ecological Interactions: Food chains, food webs, Ecological pyramids. Types of Ecosystems (Overview): Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, rivers, oceans, estuaries).	7 Hrs.
Unit 2	Natural Resources and Energy Systems: Natural Resources: Forest resources: use, over-exploitation, deforestation; Water resources: use, overutilization, floods, drought, dams; Mineral resources: extraction, environmental impacts; Food resources: agriculture, modern practices, impacts. Energy Resources: Growing energy needs, Renewable vs non-renewable energy. Alternate Energy Sources: Solar energy, Wind energy, Biomass energy, nuclear energy. Land Resources: Land as a resource, Land degradation, Soil erosion and desertification, Landslides.	7 Hrs.
Unit 3	Biodiversity and Environmental Pollution: Biodiversity: Definition: genetic, species, ecosystem diversity; Biogeographical classification of India; Values of biodiversity - Consumptive, Productive, Social, ethical, aesthetic. Biodiversity Issues: India as a mega-diversity nation, Hotspots of	7 Hrs.



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	biodiversity; Threats: habitat loss, poaching, conflicts; Endangered and endemic species. Conservation of Biodiversity: In-situ conservation, Ex-situ conservation. Environmental Pollution: Definition, causes, effects, and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Waste Management: Solid waste management, Urban and industrial waste control.	
Unit 4	Social Issues, Environmental Ethics & Protection Laws: Social Issues and Environment: Sustainable development, Urban environmental problems, Water conservation, rainwater harvesting, Watershed management, Resettlement and rehabilitation issues. Global Environmental Issues: Climate change and global warming, Acid rain, Ozone layer depletion, nuclear accidents and holocaust. Environmental Ethics: Role of ethics in environmental protection; Case-based understanding. Environmental Legislation: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act. Human Population and Environment: Population growth and its impacts, Human rights and environment.	7 Hrs.
Total Hours		28 Hrs.

Text Books:

Sr. No	Title	Author	Publisher
1	Environmental Studies	Erach Bharucha	Universities Press
2	Environmental Studies	Anubha Kaushik & C. P. Kaushik	New Age International
3	Textbook of Environmental Studies	Deeshita Dave & P. Udaya Bhaskar	Cengage Learning
4	Environmental Science	Daniel B. Botkin & Edward A. Keller	Wiley India
5	Environmental Studies: From Crisis to Cure	R. Rajagopalan	Oxford University Press


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**Reference Books:**

Sr. No.	Title	Author	Publisher
1	Principles of Environmental Science and Engineering	P. Venugopala Rao	Prentice Hall India
2	Environmental Science	G. Tyler Miller & Scott Spoolman	Cengage Learning
3	Introduction to Environmental Engineering and Science	Gilbert M. Masters & Wendell P. Ela	Pearson
4	Environmental Pollution Control Engineering	C. S. Rao	New Age International
5	Environmental Chemistry	A. K. De	New Age International

E- Learning Resources:

Sr. No.	Title	Course Instructor	Platform	Web link
1	Environmental Studies	Prof. T. R. Sreekrishnan	NPTEL/ Swayam	https://nptel.ac.in/courses/120108004
2	Environmental Engineering and Science	Prof. B. Sengupta	NPTEL/ Swayam	https://nptel.ac.in/courses/105105160
3	Ecology and Environment	Prof. A. K. Sharma	NPTEL/ Swayam	https://onlinecourses.swayam2.ac.in/ugc20_gell
4	Introduction to Environmental Science	Various Instructors	NPTEL/ Swayam	https://www.coursera.org/learn/environmental-science
5	Environmental Studies	Dr. Suresh Kumar	NPTEL/ Swayam	https://onlinecourses.swayam2.ac.in/ugc20_gell
6	Global Environmental Management	Technical University of Denmark (DTU)	Coursera	https://www.coursera.org/learn/global-environmental-management
7	Environmental Pollution	Prof. Mukesh Khare	NPTEL/ Swayam	https://nptel.ac.in/courses/105102089
8	Climate Change Science and Negotiations	Prof. Anand Patwardhan	NPTEL/ Swayam	https://nptel.ac.in/courses/120108002



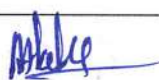
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Course Structure:

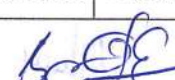
Class	S.Y. B. Tech. Sem. –III
Course Code and Course Title	0UEWHM307, Engineering Economics
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	02/00/00
Credits	02
Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWHM307_1	Analyze macroeconomic policies and economic problems using market dynamics and IS/LM models.	L4
0UEWHM307_2	Examine the impact of market failures, financial systems, and banking policies on inflation.	L4
0UEWHM307_3	Calculate business forecasts and resource allocations using budgets, cost metrics, and linear models.	L3
0UEWHM307_4	Deconstruct patterns of regional, gender, and social exclusion using growth and employment data.	L4

Course Contents:		
Unit 1	Basic Principles and Methodology of Economics Demand/Supply – elasticity –Government Policies and Application. Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes.	7 Hrs.
Unit 2	Public Sector Economics Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve.	7 Hrs.
Unit 3	Elements of Business/Managerial Economics and forms of organizations Cost & Cost Control –Techniques, Types of Costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money. Business Forecasting – Elementary techniques. Statements – Cash flow, Financial. Case Study Method.(Simple Numerical Expected)	7 Hrs.
Unit 4	Indian economy Brief overview of post independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment– Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.	7 Hrs.
Total Hours		28 Hrs.


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Text Books

Sr. No.	Title	Author	Publisher
1	Fundamentals of Engineering Economics	Pravin Kumar	Wiley Precise Text book Series
2	Principles of Economics	Mankiw Gregory N	Thompson Asia
3	Managerial Economics	V. Mote, S. Paul, G. Gupta	Tata McGraw Hill
4	Engineering Economics	James L. Riggs	McGraw-Hill Education

Reference Books

Sr. No.	Title	Author	Publisher
1	Indian Economy	Misra, S.K. and Puri	Himalaya
2	Textbook of Business Economics	Pareek Saroj	Sunrise Publishers
3	Cost Accounting Principles and Practice	S. P. Jain and K. L. Narang	Kalyani Publishers
4	Macroeconomics	N. Gregory Mankiw	Worth Publishers

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Engineering Economic Analysis	Prof. Pradeep Kumar Jha IIT Roorkee	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_me98


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Course Structure:

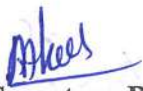
Class	S.Y. B. Tech, Sem.- III
Lab Code and Lab Title	0UEWPC308, Electrical Measurements and Instrumentation Lab
Prerequisite/s	Basic Electrical Engineering Lab
Teaching Scheme: Lecture/Tutorial/Practical	0/0/2
Credits	01
Evaluation Scheme: ISE / ESE-POE/OE	25/25 - POE

Course Outcomes (COs)		Bloom's Level
Upon successful completion of this Lab, the student will be able to:		
0UEWPC308_1	Demonstrate the working of various measuring instruments.	L3
0UEWPC308_2	Measure electrical and non-electrical parameters using appropriate instruments, bridges, and sensors.	L3
0UEWPC308_3	Select proper measuring instrument for measurement of electrical parameters.	L3
0UEWPC308_4	Communicate experimental observations and results effectively through oral presentations and laboratory reports.	L3
0UEWPC308_5	Interpret experimental results based on the observed data.	L3

List of Experiments:

Expt. No.	Title of Experiment
1	To study and demonstration of different measuring instruments.
2	Measurement of resistance by using Ammeter – voltmeter method.
3	Measurement of resistance by using Kelvin Double Bridge.
4	Measurement of inductance by using Maxwells Inductance bridge.
5	Measurement of capacitance by using Schering bridge.
6	Measurement of active power in 3 phase circuit by using two wattmeter method.
7	Measurement of reactive power in 3 phase circuit by using one wattmeter method.
8	Calibration of a Digital Energy Meter using a Standard Wattmeter and Stopwatch.
9	Measurement of displacement by using LVDT.
10	Measurement of Dynamic Pressure using a Piezoelectric Transducer.
11	Measurement of Voltage, Time Period, Frequency, and Phase Difference using Digital Storage Oscilloscope (DSO). Determination of Unknown Frequency using Lissajous Patterns in X-Y Mode.
12	Measurement of temperature using RTD and thermistor.

***Note- Minimum 10 experiments compulsory**


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Text Books

Sr. No	Title	Author	Publisher
1	A Course in Electrical and Electronic Measurements & Instrumentation	A. K. Sawhney	Dhanpat Rai & Co.
2	A Course in Electronics & Electrical Measurements & Instrumentation	J. B. Gupta	S. K. Kataria & Sons
3	Electrical Measurement & Instrumentation	U. A. Bakshi, V. A. Bakshi	Technical Publication
4	Electronic Instrumentation	H. S. Kalsi	Tata McGraw Hill

Reference Books:

Sr. No	Title	Author	Publisher
1	Electrical Measurements & Measuring Instruments	E. W. Golding, F. C. Widdis	Reem Publications
2	Electronic Measurements & Instrumentation	Oliver, B. M. Cage, J. M.	MC GRAW
3	Electrical Measurement & Instrumentation	R. S. Sirohi, Radhakrishnan	New Age International
4.	Instrumentation Measurement and Analysis	B. C. Nakra, K. K. Chaudhari	Tata McGraw Hill

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Electrical Measurement and Electronic Instruments	By Prof. Avishek Chatterjee	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ee171


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Course Structure:

Class	S. Y. B. Tech, Sem.-III
Lab Code and Lab Title	0UEWPC309, Network Analysis Lab
Prerequisite/s	Basic Electrical Engineering
Teaching Scheme: Lecture/Tutorial/Practical	0/0/2
Credits	01
Evaluation Scheme: ISE / ESE-POE/OE	25/25-POE

Course Outcomes (COs)		Bloom's Level
Upon successful completion of this Lab, the student will be able to:		
0UEWPC309_1	Verify fundamental circuit laws and network theorems through experimental analysis of electrical circuits.	L3
0UEWPC309_2	Analyze the transient response of RL, RC, and RLC series and parallel circuits under different input conditions.	L4
0UEWPC309_3	Evaluate the performance of resonant, coupled, and balanced three-phase circuits by conducting experimental investigations.	L4
0UEWPC309_4	Determine the parameters of two-port networks through experimental measurement and analysis.	L3
0UEWPC309_5	Respond Effectively in the form of oral and writing journal.	L3

List of Experiments:

Expt. No.	Title of Experiment
1	Verification of KVL & KCL
2	Verification of Superposition theorem
3	Verification of Thevenin's theorem
4	Verification of Norton's theorem
5	Verification of Maximum power transfer theorem
6	Verification of Tellegen's theorem
7	Determination of Transient Response of current in RL & RC series circuit
8	Determination of Transient Response of current in RLC series circuit
9	Determination of Transient Response of current in RLC parallel circuit
10	Frequency Response of Single-Tuned Coupled Circuit
11	Study of Series & Parallel resonance
12	Calculate Z, Y Parameters

***Note- Minimum 10 experiments compulsory**

****Instructors are encouraged to conduct MATLAB and simulation-based from listed experiments**

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Text Books

Sr. No	Title	Author	Publisher
1	Fundamentals of Electric Circuits	Alexander, C. A. / Sadiku, M. N. O.	Tata McGraw-Hill
2	Fundamental Of Network Analysis & Synthesis	Peikari, B.	Jaico Book
3	Network Analysis	Mithal, G. K.	Khanna Pub.
4	Network Analysis And Synthesis	Harlapur, V. K. / Shingare, D. Y	Electrotech Publication

Reference Books:

Sr. No	Title	Author	Publisher
1	Network Analysis	Valkenburg, V. M. E.	PHI
2	Engineering Circuit Analysis	Hayt, W. H. / Buck, J. A.	MC GRAW
3	Introductory Circuit Analysis	Bovlestrad, R. L.	Pearson
4	A Course In Electrical Circuit Analysis	Soni, M. L.	Dhanpat Rai & com.

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Network Analysis	Prof. Tapas Kumar Bhattacharya	NPTEL/Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ee14


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Course Structure:

Class	Second Year B. Tech. Sem. –III
Lab Code and Lab Title	0UEWPC310, Analog & Digital Electronics Lab
Prerequisite/s	Basic Electronics Engg
Teaching Scheme: Lecture/Tutorial/Practical	0/0/2
Credits	01
Evaluation Scheme: ISE/ESE- POE/OE	25/25-POE

Course Outcomes (COs)		Bloom's Level
Upon successful completion of this Lab, the student will be able to:		
0UEWPC310_1	Analyse basic analog circuits using operational amplifiers.	L4
0UEWPC310_2	Implement and test basic digital logic gates using ICs. Realise logic circuits using universal gates and evaluate their equivalence.	L4
0UEWPC310_3	Design and verify combinational logic circuits and sequential circuits.	L6
0UEWPC310_4	Design and implement data selection circuits.	L6
0UEWPC310_5	Demonstrate the ability to present technical concepts of analog & digital circuits through reports and oral presentations.	L3

List of Experiments:

Expt. No.	Title of Experiment
1	Study of BJT-amplifier.
2	Study of Inverting and Non-Inverting Amplifier using Op-Amp (IC 741)
3	Study of a Voltage Follower (Voltage Buffer) using an Operational Amplifier
4	Study of basic logic gates using breadboard (IC7404, IC 7408, IC 7432, IC 7486, IC7400, IC7402, IC74866)
5	Study of AND, OR, NOT gates using universal gates (IC 7400, IC 7402)
6	Study of Half adder and Full Adder using basic gates.
7	Study of Half Subtractor and Full Subtractor using basic gates.
8	Study of code converters.
9	Study of flip-flops (SR, JK, D, T flipflop)
10	Study of multiplexer and demultiplexer using logic gates.
11	Study of Shift registers
12	Study of n-Mod counter.

***Note: Minimum 10 experiments compulsory**


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Text Books

Sr. No	Title	Author	Publisher
1	Principles of Electronics	Mehta, V. K., and Mehta, R.,	S Chand
2	Electronic Devices and Circuit Theory	Robert L. Boylestad and Louis Nashelsky	Pearson Education
3	Digital Design	M. Morris Mano and Michael D. Ciletti	Pearson Education
4	Op-Amps and Linear Integrated Circuits	Ramakant A. Gayakwad	Pearson Education

Reference Books:

Sr. No	Title	Author	Publisher
1	Electronic Circuit Analysis and Design	Donald A. Neamen	McGraw-Hill Education
2	Integrated Electronics: Analog and Digital Circuits and Systems	Jacob Millman and Christos C. Halkias	McGraw-Hill Education
3	Modern Digital Electronics	R. P. Jain	McGraw-Hill Education (India)
4	Fundamentals of Digital Circuits	A. Anand Kumar	PHI Learning Pvt. Ltd.

E- Learning Resources

Sr. No	Title	Author	Publisher	Edition
1	Digital Electronic Circuits	Prof. Goutam Saha	NPTEL	nptel.ac.in/courses/108105132
2	Analog Electronic Circuits	Prof. Pradip Mandal	NPTEL	nptel.ac.in/courses/108105158


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Course Structure:

Class	S. Y. B. Tech, Sem.-III
Lab Code and Lab Title	0UEWVS311, MATLAB for Electrical Engineering Lab
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	0/0/2
Credits	01
Evaluation Scheme: ISE	50

Course Outcomes (COs)		Bloom's Level
Upon successful completion of this Lab, the student will be able to:		
0UEWVS311_1	Apply MATLAB programming constructs to solve basic engineering problems.	L3
0UEWVS311_2	Develop MATLAB programs for numerical computations and data visualization.	L3
0UEWVS311_3	Analyze electrical engineering problems using MATLAB programming.	L4
0UEWVS311_4	Develop Simulink models for electrical circuits and power electronic systems.	L3
0UEWVS311_5	Analyze the performance of electrical systems using MATLAB/Simulink simulations.	L4

List of Experiments:

Expt. No.	Title of Experiment
1	Study of MATLAB Environment and Basic Programming Constructs
2	Implementation of Matrix Operations and Solution of Linear Algebraic Equations Using MATLAB
3	Implementation of Decision-Making Statements and Looping Constructs Using MATLAB
4	Development of User-Defined Functions for Electrical Engineering Applications
5	Plotting of Two-Dimensional (2D) and Three-Dimensional (3D) Graphs Using MATLAB
6	Generation and Analysis of Different Signals (Sine, Cosine, Square, Triangular, Sawtooth, Ramp and Pulse) Using MATLAB
7	Development of MATLAB Programs for Basic Electrical Engineering Calculations (Formula based)
8	Simulation and Analysis of Resistive, RL, RC and RLC Circuits Using Simulink
9	Measurement and Analysis of Active, Reactive and Apparent Power in Single-Phase Circuits Using Simulink
10	Measurement and Analysis of Active, Reactive and Apparent Power in Three-Phase Circuits Using Simulink
11	Simulation and Verification of Network Theorems Using MATLAB/Simulink
12	Simulation and Analysis of DC Motor Characteristics Using Simulink
13	Design and Simulation of an Electrical Engineering Application Using MATLAB/Simulink

***Note- Minimum 10 experiments compulsory**

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Text Books

Sr. No	Title	Author	Publisher
1	MATLAB and Simulink for Engineers	Agam Kumar Tyagi	Oxford University Press
2	MATLAB: A Practical Introduction to Programming and Problem Solving	Stormy Attaway	Elsevier
3	Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers	Rudra Pratap	Oxford University Press
4	Introduction to MATLAB for Engineers	William J. Palm III	McGraw-Hill Education

Reference Books:

Sr. No	Title	Author	Publisher
1	MATLAB for Engineers	Holly Moore	Pearson Education
2	Essential MATLAB for Engineers and Scientists	Brian D. Hahn, Daniel T. Valentine	Elsevier
3	Power Electronics: Converters, Applications and Design	Ned Mohan, Tore M. Undeland, William P. Robbins	John Wiley & Sons
4	Modern Power Electronics and AC Drives	Bimal K. Bose	Pearson Education

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	MATLAB Programming for Numerical Computation	Prof. Niket Kaisare, IIT Madras	NPTEL/ Swayam	https://nptel.ac.in/courses/103106118?utm_source=chatgpt.com


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Course Structure:

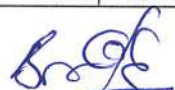
Class	S. Y. B. Tech. Semester- IV
Course Code and Course Title	0UEWPC401, Electrical Machines-I
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC401_1	Apply DC generator principles and equations to determine generated EMF, power stages, and operating characteristics.	L3
0UEWPC401_2	Choose DC motor starting, speed control, and braking methods for specified applications.	L3
0UEWPC401_3	Evaluate losses, efficiency, and performance characteristics of DC machines with suitable test.	L4
0UEWPC401_4	Illustrate equivalent circuits and phasor diagrams of single phase transformers.	L3
0UEWPC401_5	Select suitable three phase transformer connections and operating conditions for practical applications	L3
0UEWPC401_6	Determine transformer efficiency, losses, and performance parameters from test data.	L4

Course Contents:		
Unit 1	DC Generator Construction details, Working Principle, Armature winding and its factors EMF equation, Power Stages in DC Generator. Types and Characteristics of DC generators, armature reaction and its effects, commutation & methods to improve commutation, Applications of DC generator (Numerical Expected)	6 Hrs.
Unit 2	D.C. Motors Working principle of DC motor, Back EMF & its significance, Power stages in DC motor, Voltage equation, power equation, Speed Equation, Torque Equation, shaft torque, Break horse power, Types, characteristics & applications of DC Motors, Need & types of starter, Speed control methods, reversing direction of rotation and Braking Methods (Numerical Expected) Special Purpose motors: PMDC, BLDC, Stepper Motors, Servo Motors	10 Hrs.
Unit 3	Performance of DC machines IS standards for testing, Losses and Efficiency, OCC of DC generator, Brake test on DC motor, Swinburne's test on DC motor, Regenerative or Hopkinson's test on DC motor (Numerical Expected)	6 Hrs.
Unit 4	Single phase Transformer	6 Hrs.


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	Construction details, working principle, types, Concept of ideal transformer, EMF equation, Exact and approximate equivalent circuit referred to either side, General Phasor diagrams on no load and load. Voltage Regulation, , transformer rating, Special Purpose Transformers: Autotransformers, Welding Transformer, Isolation Transformer, Grounding transformer. (Numerical Expected)	
Unit 5	Three Phase Transformers Poly-phase Transformers-connecting a bank of three identical single phase transformer for three phase transformation, Standard connections for three phase transformers, their voltage Phasor diagrams, Phasor groups, Parallel operation of transformers, conditions to be satisfied, load sharing under various conditions, Open delta or V-V connection, application and vector diagram, Scott connection for three phases to two phase transformation and vice-versa, applications. (Numerical Expected)	8 Hrs.
Unit 6	Performance of Transformer Losses & Efficiency, maximum efficiency, all day efficiency, IS standards for testing, Polarity Test, Load Test, OC and SC test, Sumpner's Test, Separation of Eddy current & hysteresis losses. (Numerical Expected)	6 Hrs.
Total Hours		42 Hrs.

Text Books

Sr. No	Title	Author	Publisher
1	Theory & Performance of Electrical Machines	J.B. Gupta	Kataria, S. K., & Sons
2	Electric Machines	Kothari D.P Nagrath I.J	THM Publications
3	Electrical Machines	Ghosh, S.	Pearson
4	Electric machines	Ashfaq Husain	Dhanpatrai And Co.Publication

Reference Books:

Sr. No	Title	Author	Publisher
1	Electrical Machines	Mukherjee, P. K.	Dhanpat Rai & com
2	Electrical Machines	Bhattacharya, S. K.	McGraw Hill
3	Electrical Machines	M.V. Deshpande	PHI Publication
4	Electrical Machines	Samarjit Ghosh	Pearson

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Electrical Machines - I	Prof. Tapas Kumar Bhattacharya	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ee176


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Course Structure:

Class	S. Y. B. Tech., Semester- IV
Course Code and Course Title	0UEWPC402, Power System-I
Prerequisite/s	Basic Electrical Engineering, Circuit Analysis and Electrical Machines-I
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/20/60

Course Outcomes (COs):

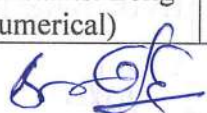
Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC402_1	Apply load characteristics, generation-economics principles and electricity-tariff structures to solve power-generation problems.	L3
0UEWPC402_2	Calculate electrical parameters of overhead transmission lines from conductor geometry and physical data.	L3
0UEWPC402_3	Analyse short, medium and long transmission lines for regulation, efficiency and power transfer.	L4
0UEWPC402_4	Determine sag, tension, clearances and insulator-string efficiency for overhead lines.	L3
0UEWPC402_5	Analyze AC/DC distribution networks and determine tariff charges and power-factor-correction requirements.	L4
0UEWPC402_6	Analyze substation arrangements and operating requirements of grounding, switchgear, HVDC and modern-grid technologies.	L4

Course Contents:

Unit 1	Power Generation and Electricity Tariffs: Thermal, hydro, nuclear and gas-turbine plants: layouts and operating principles. Solar PV, wind, small hydro and biomass. Generation. Power-system structure; load curve and load-duration curve; maximum demand, demand factor, diversity factor, load factor and plant-capacity factor (Numerical)	7 Hrs
Unit 2	Transmission-Line Parameters and Performance: Line classification; conductors, stranded and bundled conductors; skin and proximity effects. Resistance and temperature correction. Inductance and capacitance of single- and three-phase lines; GMR, GMD, transposition and effect of earth. Short-line performance; medium lines using nominal-T and nominal- π ; ABCD constants. Long-line rigorous solution, surge-impedance loading and Ferranti effect. (Numerical)	7 Hrs


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Unit 3	Mechanical Design of Overhead Lines: Conductor properties and selection; poles and towers. Sag and tension with supports at equal and unequal levels; effects of wind and ice; stringing charts, clearances, factor of safety and vibration. Insulator types; voltage distribution; string efficiency and its improvement; arcing horns, grading rings and tower-footing resistance. (Numerical)	7 Hrs
Unit 4	Distribution Systems and Power-Factor Improvement: Feeders, distributors and service mains; radial, ring-main and interconnected systems. DC distributors fed at one end and both ends; ring distributors. AC distribution, voltage-drop calculations and conductor sizing. Causes and effects of low power factor; correction using capacitor banks, synchronous condensers and phase advancers. Capacitor kVAR, location, APFC and tariff-based economic evaluation. (Numerical)	7 Hrs.
Unit 5	Substations and Switchgear: Substation classification: indoor/outdoor, pole-mounted, underground, AIS, GIS and hybrid. Equipment, busbar arrangements, single-line diagrams and layouts. Elementary switchgear, arc interruption and circuit-breaker ratings. Grounding: earth mat, step and touch potentials. Overview of relays, control supply, interlocking, SCADA and digital substations.	7 Hrs.
Unit 6	HVDC Transmission and Advanced Power-System Trends: HVAC limitations and need for HVDC; technical and economic comparison. Monopolar, bipolar and back-to-back links. Converter-station equipment; basic LCC- and VSC-HVDC operation; control, harmonics and protection. Per-unit system and change of base. Overview of symmetrical faults, storage, microgrids, smart grids, PMUs and FACTS.	7 Hrs.
Total Hours		42 Hrs.

Text Books

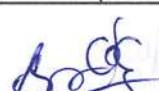
Sr. No.	Title	Author	Publisher
1	Power System Engineering	D. P. Kothari and I. J. Nagrath	McGraw Hill
2	A Course in Electrical Power system	J.B Gupta	S. K. Kataria & Sons
3	Power System Analysis	J. J. Grainger and W. D. Stevenson Jr.	McGraw Hill
4	Principles of Power System	V. K. Mehta and Rohit Mehta	S. Chand

Reference Books:

Sr. No.	Title	Author	Publisher
1.	Power System Analysis	Nagsarkar, T. K. / Sukhija, M. S.	Oxford
2.	Renewable Energy Sources	Twidell, J.	Routledge
3.	HVDC Power Transmission Systems	K. R. Padiyar	New Age International


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E-Learning Resources:

Sr. No.	Title	Course Instructor	Platform	Web link
1	Electrical Distribution System Analysis	By Prof. G. B. KumbharI IIT Roorkee	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ee69
2	Power System Engineering	Prof. Debapriya Das, IIT Kharagpur	NPTEL/ Swayam	https://nptel.ac.in/courses/108105104


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Course Structure:

Class	S.Y. B. Tech. Sem.- IV
Course Code and Course Title	0UEWPC403, Electromagnetics Engineering
Prerequisite/s	Basic Electrical Engineering
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC403_1	Use vector calculus and coordinate systems for solving electromagnetic field problems.	L3
0UEWPC403_2	Apply Coulomb's law and Gauss's law to derive electric field intensity and flux density for different charge distributions.	L3
0UEWPC403_3	Determine the Energy, Potential, Capacitance, Inductance and its energy densities.	L3
0UEWPC403_4	Analyze magnetic fields and magnetic circuits using Biot-Savart's law, Ampere's law, and inductance principles.	L4
0UEWPC403_5	Apply Faraday's law and Maxwell's equations to determine time-varying electromagnetic fields and their engineering applications.	L3
0UEWPC403_6	Determine electromagnetic wave propagation and power flow in different media using wave equations and Poynting vector.	L3

Course Contents:		
Unit 1	Vector Analysis and Coordinate Systems: Scalars and Vectors, Need for 3D Coordinate Systems, Rectangular, Cylindrical and Spherical Coordinate Systems, Transformation Between Coordinate Systems, Vector Calculus: Gradient, Divergence and Curl, Line, Surface and Volume Integrals, Divergence Theorem, Stoke's Theorem. (Numerical Expected).	7 Hrs.
Unit 2	Electrostatic Fields: Coulomb's law, electric field intensity, field due to point and continuous charges, electric field due to finite line charge, circular disc and infinite sheet of charge, electric flux density, Gauss's law and its applications, energy and potential, potential gradient, potential field of a point charge and system of charges, electric dipole, equipotential surfaces. (Numerical Expected).	8 Hrs.
Unit 3	Conductors and Dielectrics: Current and Current density, Continuity Equation, Ohm's Law in Point Form, Properties of Conductors and Dielectrics, Capacitance, Capacitance of parallel plate capacitor with single and two dielectrics, co-axial cable and two wire transmission line, Boundary Conditions for Electric Fields, Poisson's and Laplace's equations. (Numerical Expected).	7 Hrs.


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Unit 4	Magnetostatics Fields: Biot-Savart law, Magnetic Flux Density, and Magnetic Field Intensity of infinite and finite long straight conductor, circular loop, solenoid and toroid, Ampere's circuital law, and its applications, Lorentz Force, Magnetic Torque and Moment, Magnetic Boundary Conditions, Inductance of Solenoid and Toroid, Energy Stored in magnetic fields, Magnetic Boundary Conditions.(Numerical Expected).	7 Hrs.
Unit 5	Time-Varying Fields and Maxwell's Equations: Faraday's Laws of Electromagnetic Induction: Transformer EMF, Motional EMF, Conduction Current and Displacement Current, Modified Ampere's Law, Maxwell's Equations in Differential and Integral Forms, Relation between Circuit Theory and Field Theory. (Numerical Expected).	7 Hrs.
Unit 6	Electromagnetic Wave: Electromagnetic wave equations, uniform plane wave, wave parameters, wave propagation in free space, lossy and lossless dielectrics, wave propagation in conductors, skin effect, Poynting vector, and Poynting theorem.	6 Hrs.
Total Hours		42 Hrs.

Text Books

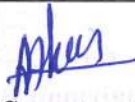
Sr. No	Title	Author	Publisher
1	Principle of Electromagnetics	Matthew N. O. Sadiku, S. V. Kulkarni	Oxford University Press
2	Engineering Electromagnetics	William H. Hayt, John A. Buck	Tata McGraw-Hill
3	Electromagnetics with Applications	John Kraus, Daniel Fleisch	Tata McGraw-Hill
4	Electromagnetics	Joseph A. Edminister	Schaum's Outline Series

Reference Books

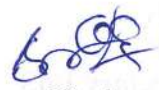
Sr. No.	Title	Author	Publisher
1	Foundation of Electromagnetic Theory	J. R. Reitz, F. J. Milford, R. W. Christie	Pearson Education
2	Elements of Electromagnetic Fields	S. P. Seth	Dhanpat Rai & Co.
3	Electromagnetic Theory & Applications	Ashutosh Pramanik	PHI Learning Private Limited
4	Electromagnetic Field Theory	K. A. Gangadhar, P. M. Ramanathan	Khanna Publishers

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Electromagnetic Theory	Prof. Pradeep Kumar K	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ee156


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Course Structure:

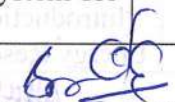
Class	S.Y. B. Tech. Sem. –IV
Course Code and Course Title	0UEWPC404, Renewable Energy Sources
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC404_1	Apply the concepts of conventional and renewable energy sources to explain global and Indian energy scenarios.	L3
0UEWPC404_2	Examine the design, operation, and applications of solar thermal and photovoltaic energy systems.	L3
0UEWPC404_3	Apply the principles of wind energy conversion systems for energy generation and site selection.	L3
0UEWPC404_4	Interpret the principles, conversion processes, and applications of biomass and biogas energy systems.	L3
0UEWPC404_5	Analyze the operation and performance of geothermal energy systems, MHD power plants, and fuel cells.	L4
0UEWPC404_6	Examine the performance of ocean energy, waste-to-energy, thermoelectric, and thermionic conversion systems.	L4

Course Contents:		
Unit 1	Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems.	7Hrs.
Unit 2	Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems. Recent developments in solar cells, role of nano-technology in solar cells, thin film solar cells, dye sensitized solar cells, perovskite solar cells, solar PV systems and their components, battery rating, inverter rating, solar PV lantern, stand-alone PV system for home lighting, solar PV water pumping system	7Hrs.


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Department of Electrical Engineering

Unit 3	Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment. Safety and environmental aspects, wind energy potential and installation in India.	7Hrs.
Unit 4	Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.	7Hrs.
Unit 5	Geothermal Energy: Resources of geothermal energy, thermodynamics of geo- thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Cells: Principle of working of various types of fuel cells and their working, performance and limitations. Hydrogen energy – Hydrogen as a fuel, application. Hydrogen production methods	7Hrs.
Unit 6	Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants. Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.	7Hrs.
Total Hours		42 Hrs.

Text Books:

Sr. No	Title	Author	Publisher
1	Energy Resources: Conventional & Non-Conventional	M.V.R. Koteswara Rao	BSP Publications
2	Non-conventional Energy Resources	D. S. Chauhan , S. K. Srivastava	New Age International.
3	"Introduction to Non-Conventional Energy Resources"	A. Raja	Scitech Publications.

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Department of Electrical Engineering

4	Non-Conventional Energy Sources	G.D Rai	Khanna Publishers
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Reference Books:

Sr. No.	Title	Author	Publisher
1	Renewable Energy Power For A Sustainable Future	Godfrey Boyle	Oxford University Press.
2	Advances in Energy System and Technology Vol. 1 & II	Peter Auer	Academic Press
3	Renewal Energy Resources	John Twideu and Tony Weir	BSP Publications
4.	Renewal Energy Technologies: A Practical Guide for Beginners	D.S. Solanki	PHI Learning

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Renewable Energy Engineering: Solar, Wind And Biomass Energy Systems	Prof. Vaibhav Vasant Goud, Prof. R. Anandalakshmi	NPTEL/ Swayam	https://nptel.ac.in/courses/103103206


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Course Structure:

Class	S.Y. B. Tech. Sem. –IV
Course Code and Course Title	0UEWMD405, Renewable Energy Sources
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/20/60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWMD405_1	Apply the concepts of conventional and renewable energy sources to explain global and Indian energy scenarios.	L3
0UEWMD405_2	Examine the design, operation, and applications of solar thermal and photovoltaic energy systems.	L3
0UEWMD405_3	Apply the principles of wind energy conversion systems for energy generation and site selection.	L3
0UEWMD405_4	Interpret the principles, conversion processes, and applications of biomass and biogas energy systems.	L3
0UEWMD405_5	Analyze the operation and performance of geothermal energy systems, MHD power plants, and fuel cells.	L4
0UEWMD405_6	Examine the performance of ocean energy, waste-to-energy, thermoelectric, and thermionic conversion systems.	L4

Course Contents:		
Unit 1	Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems.	7Hrs.
Unit 2	Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems. Recent developments in solar cells, role of nano-technology in solar cells, thin film solar cells, dye sensitized solar cells, perovskite solar cells, solar PV systems and their components, battery rating, inverter rating, solar PV lantern, stand-alone PV system for home lighting, solar PV water pumping system	7Hrs.

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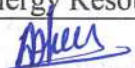


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Unit 3	Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment. Safety and environmental aspects, wind energy potential and installation in India.	7Hrs.
Unit 4	Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.	7Hrs.
Unit 5	Geothermal Energy: Resources of geothermal energy, thermodynamics of geo- thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Cells: Principle of working of various types of fuel cells and their working, performance and limitations. Hydrogen energy – Hydrogen as a fuel, application. Hydrogen production methods	7Hrs.
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Total Hours		42 Hrs.

Text Books:

Sr. No	Title	Author	Publisher
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2	Non-conventional Energy Resources	D. S. Chauhan , S. K. Srivastava	New Age International.
3	“Introduction to Non-Conventional Energy Resources”	A. Raja	Scitech Publications.


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4	Non-Conventional Energy Sources	G.D Rai	Khanna Publishers
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Reference Books:

Sr. No.	Title	Author	Publisher
1	Renewable Energy Power For A Sustainable Future	Godfrey Boyle	Oxford University Press.
2	Advances in Energy System and Technology Vol. 1 & II	Peter Auer	Academic Press
3	Renewal Energy Resources	John Twideu and Tony Weir	BSP Publications
4.	Renewal Energy Technologies: A Practical Guide for Beginners	D.S. Solanki	PHI Learning

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Renewable Energy Engineering: Solar, Wind And Biomass Energy Systems	Prof. Vaibhav Vasant Goud, Prof. R. Anandalakshmi	NPTEL/ Swayam	https://nptel.ac.in/courses/103103206


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Course Structure:

Class	S.Y. B. Tech. Sem. –IV
Course Code and Course Title	0UEWVE406, Universal Human Values
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	02/00/00
Credits	02
Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWVE406_1	Implement the principles of self-exploration and universal human values to foster harmony within oneself and in family relationships.	L3
0UEWVE406_2	Examine the interrelationship among the individual, society, and nature to promote sustainable and harmonious living.	L4
0UEWVE406_3	Differentiate ethical and unethical professional practices based on human values, constitutional principles, and professional ethics.	L4
0UEWVE406_4	Demonstrate value-based approaches for holistic living and responsible professional conduct in real-life situations.	L3

Course Contents:

Unit 1	Introduction to Universal Human Values and Self-Exploration: Introduction to Value Education, Understanding Value Education Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity, Right Understanding, Relationship and Physical Facility, Methods to Fulfil Basic Human Aspirations	7 Hrs.
Unit 2	Harmony in the Human Being and Family: Understanding Human Being as the Co-existence of the Self and the Body Distinguishing between the Needs of the Self and the Body, Understanding Harmony in the Self, Programme for Self-regulation and Health ,Harmony in the Family – the Basic Unit of Human Interaction , Trust and Respect as Foundational Human Values	7 Hrs.
Unit 3	Harmony in Society and Nature: Understanding Harmony in Society , Vision for the Universal Human Order Understanding Harmony in Nature, Interconnectedness, Self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence, SDGs and responsible citizenship.	7 Hrs.
Unit 4	Professional Ethics and Holistic Living: Natural Acceptance of Human Values , Definitiveness of Ethical Human Conduct , Humanistic Education, Constitution and Universal Human Order Competence in Professional Ethics, Holistic Technologies, ethical use of	7 Hrs.


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Artificial Intelligence, workplace integrity and sustainability in engineering practice, Transition towards Value-based Life and Profession	
Total Hours	28 Hrs.

Text Books

Sr. No	Title	Author	Publisher
1	A Foundation Course in Human Values and Professional Ethics,	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi,
2	Human Values	A.N. Tripathi	New Age Intl. New Delhi

Reference Books

Sr. No.	Title	Author	Publisher
1	Small is Beautiful -	E. F Schumacher.	Blond & Briggs, London (UK)
2	Economy of Permanence: A Quest for a Social Order Based on Non-violence	J. C. Kumarappa	Sarva Seva Sangh Prakashan, Rajghat, Varanasi, India

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Moral Thinking: An Introduction to Values and Ethics	Prof. Vineet Sahu IIT Kanpur	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_hs232


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Course Structure:

Class	S. Y. B. Tech., Semester- IV
Course Code and Course Title	0UEWHM407, Entrepreneurship Development
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	02/00/00
Credits	02
Evaluation Scheme: ISE	50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWHM407_1	Demonstrate entrepreneurial and intrapreneurial leadership attributes in professional contexts.	L3
0UEWHM407_2	Use design thinking techniques to identify problems and validate customer needs.	L4
0UEWHM407_3	Apply innovative solutions and develop prototypes/MVPs to achieve iterative problem-solution fit.	L3
0UEWHM407_4	Prepare business models, financial plans, and go-to-market strategies for entrepreneurial ventures.	L3

Course Contents:		
Unit 1	Entrepreneurship Fundamentals & Context Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. Gamified role play based exploration aligned to one's short term career aspiration and ambition. An understanding of how to build entrepreneurial mindset, skillsets, attributes and networks while on campus.	7Hrs.
Unit 2	Problem & Customer Identification Understanding and analyzing the macro Problem and Industry perspective, technological, socio-economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles. Analyzing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity	7 Hrs.
Unit 3	Solution design & Prototyping Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding 6 14 prototyping and MVP. Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of concept and iterate on the prototype	7 Hrs.


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Unit 4	Business & Financial Model, Go-to-Market Plan Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build -Measure – Lean approach Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analyzing financial performance. Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy.	7 Hrs.
Total Hours		28 Hrs.

Text Books:

Sr. No	Title	Author	Publisher
1	Just Aspire: Notes on Technology, Entrepreneurship and the Future	Chowdhry Ajay	HarperCollins Publishers India
2	The Dolphin and the Shark: Stories on Entrepreneurship	Namita Thapar	Penguin Books Limited
3	Effectuation: Elements of Entrepreneurial Expertise	Saras D. Sarasvathy	Elgar Publishing Ltd
4	Entrepreneurship	Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha	McGraw-Hill

Reference Books:

Sr. No.	Title	Author	Publisher
1	Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers	Alexander Osterwalder & Yves Pigneur	John Wiley & Sons
2	Built to Last: Successful Habits of Visionary Companies	Jim Collins and Jerry I. Porras	HarperCollins Publishers
3	Small Giants: Companies That Choose to Be Great Instead of Big	Bo Burlingham	Portfolio (Penguin Random House)
4.	Change by Design, Revised and Updated: How Design Thinking Transforms Organizations and Inspires Innovation	Tim Brown	HarperCollins Publishers


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E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Innovation, Business Models and Entrepreneurship	Prof. Rajat Agrawal Prof. Vinay Sharma	NPTEL/ Swayam	https://nptel.ac.in/courses/110107094


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Course Structure:

Class	S. Y. B. Tech. Semester- III
Lab Code and Lab Title	0UEWPC408, Electrical Machines I Lab
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE-POE/OE	25/25-POE

Course Outcomes (COs)		Bloom's Level
Upon successful completion of this Lab, the student will be able to:		
0UEWPC408_1	Analyze performance parameters of DC machines by using appropriate testing methods.	L4
0UEWPC408_2	Demonstrate different tests and speed control methods of DC machines.	L3
0UEWPC408_3	Perform different tests on Transformer to find performance parameters.	L3
0UEWPC408_4	Communicate effectively in the form of oral and writing journal.	L3
0UEWPC408_5	Practice safety precautions and ethics while performing experiments in Laboratory.	L3

List of Experiments:

Expt. No.	Title of Experiment
1	Determination of OCC characteristics of d.c generator.
2	Determination of performance of DC shunt Generator by Direct Load test
3	Speed control of D.C shunt motor by armature and field control.
4	Determination of performance of DC shunt Motor by Load test
5	Determination of performance of DC shunt Motor by Swinburne's test
6	Determination of performance of DC Motor by Hopkinson's Test.
7	Determination Polarity and Ratio test on single phase transformer.
8	Determination of performance of single phase transformer by performing Open circuit and short circuit test.
9	Determination of performance of three phase transformer by performing direct load test
10	Perform Parallel operation of single phase transformer for load sharing
11	Determination of performance of 1 Φ Transformer by Sumpner's Test
12	Separation of iron loss into hysteresis and eddy current loss components in a1 Φ Transformer.

Note: Lab should consist of minimum ten experiments

Text Books

Sr. No	Title	Author	Publisher
1	Theory & Performance of Electrical Machines	J.B. Gupta	Kataria, S. K., & Sons
2	Electric Machines	Kothari D.P Nagrath I.J	THM Publications

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3	Electrical Machines	Ghosh, S.	Pearson
4	Electric machines	Ashfaq Husain	Dhanpatrai And Co.Publication

Reference Books:

Sr. No	Title	Author	Publisher
1	Electrical Machines	Mukherjee, P. K.	Dhanpat Rai & com
2	Electrical Machines	Bhattacharya, S. K.	McGraw Hill
3	Electric machines	M.V. Deshpande	PHI Publication
4	Electric machines	Samarjit Ghosh	Pearson

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Electrical Machines - I	Prof. Tapas Kumar Bhattacharya	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ee176


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Course Structure:

Class	S. Y. B. Tech., Semester -IV
Course Code and Course Title	0UEWPC409, Power System-I Lab
Prerequisite/s	Basic Electrical Engineering, Circuit Analysis
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: : ISE / ESE-POE	25/25-POE

Course Outcomes (COs):

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0UEWPC409_1	Illustrate the layouts of different power plants..	L3
0UEWPC409_2	Calculate power-plant performance factors using MATLAB..	L3
0UEWPC409_3	Determine transmission-line parameters using MATLAB.	L3
0UEWPC409_4	Calculate corona loss, string efficiency, sag and tension.	L3
0UEWPC409_5	Analyze transmission-line performance and substation arrangements..	L3

List of Experiments:

Expt. No.	Title of Experiment
1	Study of a thermal power plant and preparation of its layout diagram on a drawing sheet.
2	Study of a hydroelectric power plant and preparation of its layout diagram on a drawing sheet.
3	Study of a nuclear power plant and preparation of its layout diagram on a drawing sheet.
4	Determination of load factor, demand factor, diversity factor and plant capacity factor using MATLAB.
5	Calculation of resistance and capacitance of an overhead transmission line using MATLAB.
6	Calculation of GMD, GMR and inductance of a three-phase overhead transmission line using MATLAB.
7	Determination of corona loss in an overhead transmission line using MATLAB.
8	Calculation of string efficiency and voltage distribution across a suspension-insulator string using MATLAB.
9	Calculation of sag and tension under normal, wind-loading and ice-loading conditions using MATLAB
10	Performance analysis of a short transmission line and determination of voltage regulation and efficiency using MATLAB
11	Performance analysis of a medium transmission line using nominal-T and nominal- π


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	methods in MATLAB.
12	Study of different substation layouts and busbar arrangements.

***Note- Minimum 10 experiments compulsory**

Text Books

Sr. No.	Title	Author	Publisher
1	Power System Engineering	D. P. Kothari and I. J. Nagrath	McGraw Hill
2	A Course in Electrical Power system	J.B Gupta	S. K. Kataria & Sons
3	Power System Analysis	J. J. Grainger and W. D. Stevenson Jr.	McGraw Hill
4	Principles of Power System	V. K. Mehta and Rohit Mehta	S. Chand

Reference Books:

Sr. No.	Title	Author	Publisher
1	Power System Analysis	Nagsarkar, T. K. / Sukhija, M. S.	Oxford
2	Renewable Energy Sources	Twidell, J.	Routledge
3	HVDC Power Transmission Systems	K. R. Padiyar	New Age International

E-Learning Resources:

Sr. No.	Title	Course Instructor	Platform	Web link
1	Programming with MATLAB	Mathwork	MATLAB	https://in.mathworks.com/products/matlab/programming-with-matlab.html
2	Matlab Programming for Numerical Computation	By Prof. Niket Kaisare IIT Madras	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_ge05
3	Power System Engineering	Prof. Debapriya Das, IIT Kharagpur	NPTEL/ Swayam	https://nptel.ac.in/courses/108105104


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Department of Electrical Engineering

Course Structure:

Class	S. Y. B. Tech, Sem.-IV
Lab Code and Lab Title	0UEWAE410, Electrical Planning Lab
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial/Practical	0/0/2
Credits	01
Evaluation Scheme: ISE	50

Course Outcomes (COs)		Bloom's Level
Upon successful completion of this Lab, the student will be able to:		
0UEWAE410_1	Develop electrical design projects using EPLAN Electric P8.	L3
0UEWAE410_2	Develop industrial electrical schematics using IEC symbols and component libraries.	L3
0UEWAE410_3	Apply electrical device selection, terminal management, wiring, and cross-referencing techniques.	L3
0UEWAE410_4	Analyze power load requirements and prepare electrical planning documentation.	L4
0UEWAE410_5	Analyze and validate PLC, MCC, and PCC panel designs using EPLAN Electric P8.	L4

List of Experiments:

Expt. No.	Title of Experiment
1	Study of EPLAN Electric P8 interface, project explorer, page navigator, and workspace customization.
2	Create an electrical project and configure project properties, page properties, frames, title blocks, and page structure.
3	Study and apply IEC symbols, device identification, symbol properties, connection points, and component libraries.
4	Study industrial electrical components including MCB, MCCB, contactor, overload relay, relay, SMPS, terminal blocks, push buttons, and indicating lamps with their applications and specifications.
5	Perform basic power load calculations and select suitable electrical devices based on load, ratings, specifications, and application requirements.
6	Develop lighting and power wiring schematics using standard IEC symbols in EPLAN Electric P8.
7	Design DOL and Forward-Reverse motor starter schematics with suitable protection, control, and interlocking arrangements.
8	Create terminal strips, wire numbering, cable connections, and cross-references for industrial electrical control circuits.
9	Prepare electrical planning documentation for an industrial control panel including load details, device selection, BOM, cable schedule, terminal list, and component reports.
10	Design a PLC control panel schematic including PLC I/O wiring, control components, terminal connections, and panel documentation.


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Department of Electrical Engineering

11	Design an MCC panel schematic including motor feeders, protection, control circuits, component selection, and panel documentation.
12	Design a PCC panel schematic including load distribution, protective devices, metering, component selection, and panel documentation.

***Note- Minimum 10 experiments compulsory**

Text Books

Sr. No.	Title	Author	Publisher
1	EPLAN Electric P8 Reference Handbook	EPLAN Software & Service GmbH	EPLAN
2	EPLAN Electric P8 Getting Started Guide	EPLAN Software & Service GmbH	EPLAN
3	Electrical Design with EPLAN Electric P8 (Training Manual)	EPLAN Education	EPLAN

Reference Books:

Sr. No.	Title	Author	Publisher
1	Electrical Machine Design	A. K. Sawhney	Dhanpat Rai & Co.
2	Industrial Motor Control	Stephen L. Herman	Cengage Learning
3	Practical Electrical Design of Industrial Facilities	Peter F. Smith	Wiley-IEEE Press
4	Standard Handbook for Electrical Engineers	H. Wayne Beaty	McGraw-Hill
5	Electrical Wiring Industrial	Stephen L. Herman	Cengage Learning

Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web link
1	Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software	Prof. Ankur Gupta, IIT Delhi	NPTEL/ Swayam	https://onlinecourses.nptel.ac.in/elearning/previaw/noc26_ee187
2	EPLAN Education & Training	EPLAN Software & Service GmbH (Training Team)	NPTEL/ Swayam	https://www.eplan.com/in-en/services/training/


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