

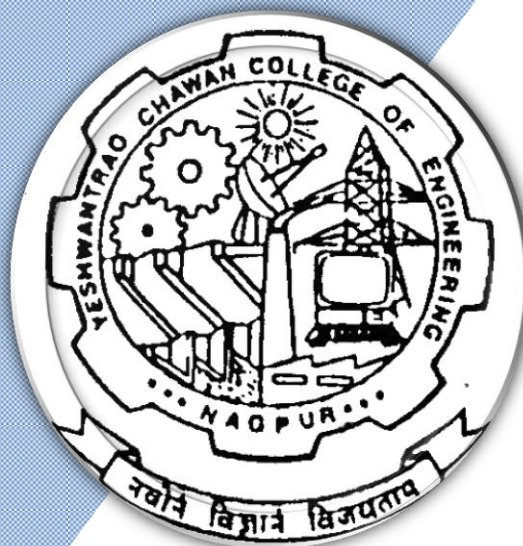
Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

1st to 6th Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
 (An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.TECH SCHEME OF EXAMINATION 2023
 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
 B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
FIRST SEMESTER (GROUP-B)																
1	1	BS	GE	23GE1102	Differential Equations, Matrices and Statistics	T	3	0	0	3	3	30	20	50	3	
2	1	BS	GE	23GE1108	Engineering Physics	T	3	0	0	3	3	30	20	50	3	
3	1	BS	GE	23GE1109	Lab : Engineering Physics	P	0	0	2	2	1		60	40		
4	1	BES	ME	23ME1101	Engineering Graphics	T	1	0	0	1	1	30	20	50	3	
5	1	BES	ME	23ME1102	Lab : Engineering Graphics	P	0	0	4	4	2		60	40		
6	1	BES	EL	23EL1101	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3	
7	1	BES	EL	23EL1105	Lab : Electrical and Electronics Workshop	P	0	0	2	2	1		60	40		
8	1	PC	EL	23EL1103	Fundamentals of Electrical Engineering	T	3	0	0	3	3	30	20	50	3	
9	1	PC	EL	23EL1104	Lab : Fundamentals of Electrical Engineering	P	0	0	2	2	1		60	40		
10	1	VSEC	GE	23GE1117	Get Set Go	---	---	---	---	---	2		60	40		
11	1	CC2	GE		Liberal Learning Course (LLC2)	---	---	---	---	---	2		60	40		
TOTAL FIRST SEM							13	0	10	23	22					

MANDATORY LEARNING COURSES

1	1	HS		GE2131	Universal Human Values (UHV)	A	2	0	0	2	0				
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SECOND SEMESTER (GROUP-B)

1	2	BS	GE	23GE1201	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1204	Applied Chemistry	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1205	Lab : Applied Chemistry	P	0	0	2	2	1		60	40	
4	2	HS/AEC 1	GE	23GE1212	Professional Communication	T	2	0	0	2	2	30	20	50	2
5	2	HS/IKS	GE	23GE1215	Indian Knowledge System	T	2	0	0	2	2	30	20	50	2
6	2	BES	CV	23CV1201	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3
7	2	BES	CV	23CV1202	Lab : Engineering Mechanics	P	0	0	2	2	1		60	40	
8	2	BES	IT	23IT1203	Programming for Problem Solving	T	2	0	0	2	2	30	20	50	2
9	2	BES	IT	23IT1204	Lab : Programming for Problem Solving	P	0	0	2	2	1		60	40	
10	2	VSEC	GE	23GE1218	Functional English	...	...	...	...	...	2		60	40	
11	2	CC1	GE		Liberal Learning Course (LLC1)	...	...	...	...	...	2		60	40	
TOTAL SECOND SEM							15	0	6	21	22				

MANDATORY LEARNING COURSES

1	2	HS		GE2301	Disaster Management and Preparedness	A	2	0	0	2	0				
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  Chairperson	 Dean (Acad. Matters)	July, 2023 Date of Release	1.00 Version	Applicable for AY 2023-24 Onwards



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B.TECH SCHEME OF EXAMINATION 2023
 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
Liberal Learning Course															
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject										
1	2	CC2	GE	LLC1201	Music (Vocal)										
2	2	CC2	GE	LLC1202	Music (Instrumental)										
3	2	CC2	GE	LLC1203	Indian Classical Dance										
4	2	CC2	GE	LLC1204	Folk Dances										
5	2	CC2	GE	LLC1205	Painting										
6	2	CC2	GE	LLC1206	Theatre and acting										
7	2	CC2	GE	LLC1207	Photography										
8	2	CC2	GE	LLC1208	Yoga										
9	2	CC2	GE	LLC1209	Chess										
10	2	CC2	GE	LLC1210	Athletics										
11	2	CC2	GE	LLC1211	Basket Ball										
12	2	CC2	GE	LLC1212	Judo										
13	2	CC2	GE	LLC1213	Elements of Japanese Language										
14	2	CC2	GE	LLC1214	Elements of German Language										
15	2	CC2	GE	LLC1215	Elements of French Language										
16	2	CC2	GE	LLC1216	Elements of Spanish Language										
17	2	CC2	GE	LLC1217	Basics of Vedic Maths										
18	2	CC2	GE	LLC1218	Skillling in Microsoft Visio and Inkscape										
19	2	CC2	GE	LLC1219	Art of Public Speaking										
20	2	CC2	GE	LLC1220	Kabbadi										
21	2	CC2	GE	LLC1221	Kho-Kho										
22	2	CC2	GE	LLC1222	Volley Ball										
23	2	CC2	GE	LLC1223	Holistic Wellness										
24	2	CC2	GE	LLC1224	Nutrition and Diet										

Liberal Learning Course															
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject										
1	1	CC1	GE	LLC1101	Music (Vocal)										
2	1	CC1	GE	LLC1102	Music (Instrumental)										
3	1	CC1	GE	LLC1103	Indian Classical Dance										
4	1	CC1	GE	LLC1104	Folk Dances										
5	1	CC1	GE	LLC1105	Painting										
6	1	CC1	GE	LLC1106	Theatre and acting										
7	1	CC1	GE	LLC1107	Photography										
8	1	CC1	GE	LLC1108	Yoga										
9	1	CC1	GE	LLC1109	Chess										
10	1	CC1	GE	LLC1110	Athletics										
11	1	CC1	GE	LLC1111	Basket Ball										
12	1	CC1	GE	LLC1112	Judo										
13	1	CC1	GE	LLC1113	Elements of Japanese Language										
14	1	CC1	GE	LLC1114	Elements of German Language										
15	1	CC1	GE	LLC1115	Elements of French Language										
16	1	CC1	GE	LLC1116	Elements of Spanish Language										
17	1	CC1	GE	LLC1117	Basics of Vedic Maths										
18	1	CC1	GE	LLC1118	Skillling in Microsoft Visio and Inkscape										
19	1	CC1	GE	LLC1119	Art of Public Speaking										
20	1	CC1	GE	LLC1120	Kabbadi										
21	1	CC1	GE	LLC1121	Kho-Kho										
22	1	CC1	GE	LLC1122	Volley Ball										
23	1	CC1	GE	LLC1123	Holistic Wellness										
24	1	CC1	GE	LLC1124	Nutrition and Diet										

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : TA1-5 marks on Proctored Online Exam, TA2-12 marks on activitied decided by course teacher, TA3 - 3 marks on class attendance

TA** = for Practical : MSPA will be 15 marks each

 Chairperson		 Dean (Acad. Matters)		July, 2023	1.00	Applicable for AY 2023-24 Onwards
				Date of Release	Version	



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							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	BS	GE	23GE1302	Integral Transform	T	3	0	0	3	3	30	20	50	3
2	3	HSSM-1	GE	23GE1301	Fundamentals of Management & Economics	T	2	0	0	2	2	30	20	50	3
3	3	VEC-1	CV	23CV1311	Environmental Sustainability, Pollution and Management	T	2	0	0	2	2	30	20	50	3
4	3	PC	EL	23EL1301	Electrical Energy Generation System	T	3	0	0	3	3	30	20	50	3
5	3	PC	EL	23EL1302	Lab: Renewable Energy Sources	P	0	0	2	2	1		60	40	
6	3	PC	EL	23EL1303	Network Analysis	T	3	0	0	3	3	30	20	50	3
7	3	PC	EL	23EL1304	Lab : Electrical Engineering Workshop	P	0	0	2	2	1		60	40	
8	3	PC	EL	23EL1305	Electrical Machines	T	3	0	0	3	3	30	20	50	3
9	3	PC	EL	23EL1306	Lab : Electrical Machines	P	0	0	2	2	1		60	40	
10	3	CEP	EL	23EL1307	Community Engagement Project	P	0	0	2	4	2		60	40	
11	3	OE-I	OE		Open Elective -I	T	2	0	0	2	2	30	20	50	3
12	3	MDM	MDM		MD Minor Course-I	T	2	0	0	2	2	30	20	50	3
TOTAL							20	0	8	30	25				

List of Mandatory Learning Course (MLC)

1	3	HS	T&P	MLC2123	YCAP3 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Open Elective - I

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject
1	3	OE1	GE	23OE1301	OE-I : Combinatorics
2	3	OE1	GE	23OE1302	OE-I : Fuzzy Set Theory, Arithmetic And Logic
3	3	OE1	GE	23OE1303	OE-I : Green Chemistry & Sustainability
4	3	OE1	GE	23OE1304	OE-I : Hydrogen Fuel
5	3	OE1	GE	23OE1305	OE-I : Electronic Materials And Applications
6	3	OE1	GE	23OE1306	OE-I : Laser Technology And Applications
7	3	OE1	MGT	23OE1307	OE-I : Finance And Cost Management
8	3	OE1	MGT	23OE1308	OE-I : Operation Research Techniques
9	3	OE1	MGT	23OE1309	OE-I : Project Evaluation & Management
10	3	OE1	MGT	23OE1310	OE-I : Total Quality Management
11	3	OE1	MGT	23OE1311	OE-I : Value Engineering
12	3	OE1	MGT	23OE1312	OE-I : Maintenance Management
13	3	OE1	MGT	23OE1313	OE-I : Industrial Safety
14	3	OE1	MGT	23OE1314	OE-I : Industry 4.0
15	3	OE1	MGT	23OE1315	OE-I : Operation Management
16	3	OE1	MGT	23OE1316	OE-I : Material Management
17	3	OE1	MGT	23OE1317	OE-I : Hospitality Management
18	3	OE1	MGT	23OE1318	OE-I : Human Resource Management & Organizational Behaviour
19	3	OE1	MGT	23OE1319	OE-I : Agri-Business Management
20	3	OE1	MGT	23OE1320	OE-I : Rural Marketing
21	3	OE1	MGT	23OE1321	OE-I : Marketing Management
22	3	OE1	MGT	23OE1322	OE-I : Health Care Management
23	3	OE1	MGT	23OE1323	OE-I : Designated approved online NPTEL/KKSU Course
24	3	OE1	MGT	23OE1324	OE-I : Indian Archeology
25	3	OE1	MGT	23OE1325	OE-I : Social & Positive Psychology
26	3	OE1	MGT	23OE1326	OE-I : Seismology & Earthquake

		July, 2023	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2023-24 Onwards



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SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
FOURTH SEMESTER																
1	4	HSSM-2	GE	23GE1401	Entrepreneurship Development	T	2	0	0	2	2	30	20	50	3	
2	4	AEC-2	GE	23GE1405 23GE1406	Marathi Language Hindi Language	T	2	0	0	2	2	30	20	50	3	
3	4	PC	EL	23EL1401	Electrical Measurement and Instrumentation	T	3	0	0	3	3	30	20	50	3	
4	4	PC	EL	23EL1402	Lab : Electrical Measurement and Instrumentation	P	0	0	2	2	1		60	40		
5	4	PC	EL	23EL1403	Electrical Machines in Power System	T	3	0	0	3	3	30	20	50	3	
6	4	PC	EL	23EL1404	Lab : Electrical Machines in Power System	P	0	0	2	2	1		60	40		
7	4	VSEC-3	EL	23EL1405	Lab : Computer Programming	P	0	0	2	4	2		60	40		
8	4	VEC-2	EL	23EL1406	Digital Signal Processing	T	2	0	0	2	2	30	20	50	3	
9	4	MDM	EL		MD Minor Course-II	T	2	0	0	2	2	30	20	50	3	
10	4	OE-2	OE		Open Elective-II	T	2	0	0	2	2	30	20	50	3	
TOTAL							16	0	6	24	20					

List of Mandatory Learning Course (MLC)

1	4	HS	T&P	MLC2124	YCAP4 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Open Elective - II

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	4	OE2	GE	23OE2401	OE-II : Combinatorics
2	4	OE2	GE	23OE2402	OE-II : Fuzzy Set Theory, Arithmetic And Logic
3	4	OE2	GE	23OE2403	OE-II : Green Chem. & Sustainability
4	4	OE2	GE	23OE2404	OE-II : Hydrogen Fuel
5	4	OE2	GE	23OE2405	OE-II : Electronic Materials And Applications
6	4	OE2	GE	23OE2406	OE-II : Laser Technology And Applications
7	4	OE2	MGT	23OE2407	OE-II : Finance And Cost Management
8	4	OE2	MGT	23OE2408	OE-II : Operation Research Techniques
9	4	OE2	MGT	23OE2409	OE-II : Project Evaluation & Management
10	4	OE2	MGT	23OE2410	OE-II : Total Quality Management
11	4	OE2	MGT	23OE2411	OE-II : Value Engineering
12	4	OE2	MGT	23OE2412	OE-II : Maintenance Management
13	4	OE2	MGT	23OE2413	OE-II : Industrial Safety
14	4	OE2	MGT	23OE2414	OE-II : Industry 4.0
15	4	OE2	MGT	23OE2415	OE-II : Operation Management
16	4	OE2	MGT	23OE2416	OE-II : Material Management
17	4	OE2	MGT	23OE2417	OE-II : Hospitality Management
18	4	OE2	MGT	23OE2418	OE-II : Human Resource Management & Organizational Behaviour
19	4	OE2	MGT	23OE2419	OE-II : Agri-Business Management
20	4	OE2	MGT	23OE2420	OE-II : Rural Marketing
21	4	OE2	MGT	23OE2421	OE-II : Marketing Management
22	4	OE2	MGT	23OE2422	OE-II : Health Care Management
23	4	OE2	MGT	23OE2423	OE-II : Designated approved online NPTEL/KKSU Course
24	4	OE2	MGT	23OE2424	OE-II : Indian Archeology
25	4	OE2	MGT	23OE2425	OE-II : Social & Positive Psychology
26	4	OE2	MGT	23OE2426	OE-II : Seismology & Earthquake

		July, 2023	1.00	Applicable for AY 2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	



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**SoE No.
23EL-101**

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
FIFTH SEMESTER																
1	5	PC	EL	23EL1501	Control System	T	3	0	0	3	3	30	20	50	3	
2	5	PC	EL	23EL1502	Lab : Control System	P	0	0	2	2	1		60	40		
3	5	PC	EL	23EL1503	Power Electronics	T	3	0	0	3	3	30	20	50	3	
4	5	PC	EL	23EL1504	Lab : Power Electronics	P	0	0	2	2	1		60	40		
5	5	PC	EL	23EL1505	Fundamentals of Power System	T	3	0	0	3	3	30	20	50	3	
6	5	PC	EL	23EL1506	Lab : Power System	P	0	0	2	2	1		60	40		
7	5	PE	EL		Professional Elective-I	T	3	0	0	3	3	30	20	50	3	
8	5	PE	EL		Professional Elective-II	T	3	0	0	3	3	30	20	50	3	
9	5	OE-3	OE		Open Elective-III	T	3	0	0	3	3	30	20	50	3	
10	5	MDM	EL		MD Minor Course-III	T	3	0	0	3	3	30	20	50	3	
11	5	STR	EL	23EL1507	Internship and Indsutrial Visit	P	0	0	2	2	1		60	40		
TOTAL							21	0	8	29	25					

List of Mandatory Learning Course (MLC)

1	5	HS	T&P	MLC2125	YCAP5 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Professional Elective - I

1	5	PE-I	EL	23EL1521	PE-I : Electric and Magnetic Field										
2	5	PE-I	EL	23EL1522	PE-I : Electrical Machine Design										
3	5	PE-I	EL	23EL1523	PE-I : Design of Photovoltaic System										
4	5	PE-I	EL	23EL1524	PE-I : Electric Power Utilization										
5	5	PE-I	EL	23EL1525	PE-I : Applications of Renewable Energy Sources										
6	5	PE-I	EL	23EL1526	PE-I : Optimization Techniques										
7	5	PE-I	EL	23EL1527	PE-I : Thermal Power Plant Familiarization										

Professional Elective - II

1	5	PE-II	EL	23EL1541	PE-II : Illumination Engineering(MOOC)										
2	5	PE-II	EL	23EL1542	PE-II : Electrical Wiring: Estimation and Costing										
3	5	PE-II	EL	23EL1543	PE-II : Sensors and Actuators										
4	5	PE-II	EL	23EL1544	PE-II : Distributed Generations in Power System										
5	5	PE-II	EL	23EL1545	PE-II : 8085 Programming										
6	5	PE-II	EL	23EL1546	PE-II : Analog and Digital Electronics										

Coursera Elective

1	5	PE-II	EL	23EL1547	PE-II : Power Electronics Specialization										
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Open Elective - III

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	FACULTY
1	5	OE3	CSE	23OE3501	OE-III : Social Reformers in Modern Maharashtra	ARTS
2	5	OE3	CSE	23OE3502	OE-III : Independent India 1948-2010	ARTS
3	5	OE3	CT	23OE3503	OE-III : Introduction To Cognitive Psychology	ARTS
4	5	OE3	CT	23OE3504	OE-III : Introduction To Engineering Psychology	ARTS
5	5	OE3	CT	23OE3505	OE-III : Introduction To Behavioural Psychology	ARTS
6	5	OE3	CT	23OE3506	OE-III : Introduction To Emotional Psychology	ARTS
7	5	OE3	EL	23OE3507	OE-III : Elements of Public Administration	ARTS
8	5	OE3	ETC	23OE3508	OE-III : Ancient Indian History	ARTS
9	5	OE3	IT	23OE3509	OE-III : Consciousness Studies	ARTS
10	5	OE3	IT	23OE3510	OE-III : Psychology for Professionals	ARTS
11	5	OE3	IT	23OE3511	OE-III : Introduction to Sociology and Human Behavior	ARTS
12	5	OE3	GE	23OE3512	OE-III : Economics of Money and Banking	ARTS
13	5	OE3	GE	23OE3513	OE-III : Economics of Capital Market	ARTS
14	5	OE3	GE	23OE3514	OE-III : Digital Humanities	ARTS
15	5	OE3	GE	23OE3515	OE-III : Introduction to Political Science	ARTS
16	5	OE3	CT	23OE3516	OE-III : Bhagwat Geeta - An Engineer's Interpretation	ARTS - IKS
17	5	OE3	CT	23OE3517	OE-III : Artha shastra by Kautiliya	ARTS - IKS
18	5	OE3	CSD	23OE3518	OE-III : Glimpses of Ancient science and Technology	ARTS - IKS
19	5	OE3	CV	23OE3519	OE-III : Indian taxation system	COMMERCE
20	5	OE3	CV	23OE3520	OE-III : Elements of share trading	COMMERCE
21	5	OE3	EE	23OE3521	OE-III : Introduction to Fintech	COMMERCE
22	5	OE3	EE	23OE3522	OE-III : Financial Analytics	COMMERCE
23	5	OE3	ETC	23OE3523	OE-III : Fundamentals of Investments	COMMERCE
24	5	OE3	EE	23OE3524	OE-III : Lifestyle Diseases	HEALTHCARE & MEDICINE
25	5	OE3	EE	23OE3525	OE-III : Holistic Nutrition	HOME SCIENCE
26	5	OE3	EL	23OE3526	OE-III : Community Organization & Development	HOME SCIENCE
27	5	OE3	CSE	23OE3527	OE-III : Human Rights & International Laws	LAW
28	5	OE3	CSE	23OE3528	OE-III : Cyber Crime Administration	LAW
29	5	OE3	MATHS	23OE3529	OE-III : Finite Differences & Numerical Methods	SCIENCE
30	5	OE3	MATHS	23OE3530	OE-III : Business Statistics	SCIENCE
31	5	OE3	PHY	23OE3531	OE-III : Crystalline Solids: Properties and Applications.	SCIENCE
32	5	OE3	PHY	23OE3532	OE-III : Nanotechnology: Fundamental to Applications	SCIENCE
33	5	OE3	CHE	23OE3533	OE-III : Chemistry in daily life	SCIENCE
34	5	OE3	CHE	23OE3534	OE-III : Battery Systems and Management	SCIENCE
35	5	OE3	NPTL	23OE3535	OE-III : Designated approved online NPTEL Course	NPTL

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Yeshwantrao Chavan College of Engineering
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B.TECH SCHEME OF EXAMINATION 2023
 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
 B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
SIXTH SEMESTER																
1	6	PC	EL	23EL1601	Power System Analysis	T	3	0	0	3	3	30	20	50	3	
2	6	PC	EL	23EL1602	Fundamentals of Electrical Drives	T	3	0	0	3	3	30	20	50	3	
3	6	PC	EL	23EL1603	Lab : Fundamentals of Electrical Drives	P	0	0	2	2	1		60	40		
4	6	PC	EL	23EL1604	Lab : Electronics Engineering workshop	P	0	0	2	2	1		60	40		
5	6	PC	EL	23EL1605	Lab : Simulation in Power Electronics	P	0	0	2	2	1		60	40		
12	6	PC	EL	23EL1606	Design Thinking in Electrical Engineering & Research Methodology	T	2	0	0	2	2	30	20	50	3	
6	6	PE	EL		Professional Elective -III	T	2	0	0	2	3	30	20	50	3	
7	6	PE	EL		Lab : Professional Elective -III	P	0	0	2	2	1		60	40		
8	6	PE	EL		Professional Elective -IV	T	3	0	0	3	3	30	20	50	3	
9	6	MDM	EL		MD Minor Course-IV	T	3	0	0	3	3	30	20	50	3	
10	6	VSEC-4	EL	23EL1607	Lab.:Substation Design	P	0	0	2	4	2		60	40		
11	6	STR	EL	23EL1608	Project Phase -I	P	0	0	4	4	2		60	40		
TOTAL							16	0	14	32	25					

List of Mandatory Learning Course (MLC)

1	6	HS		MLC126	YCAP6 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Professional Electives-III

1	6	PE-III	EL	23EL1621	PE-III : Electrical Installation Design
2	6	PE-III	EL	23EL1622	PE-III : Lab : Electrical Installation Design
3	6	PE-III	EL	23EL1623	PE-III : Electrical Energy Audit and Safety Analysis
4	6	PE-III	EL	23EL1624	PE-III : Lab : Electrical Energy Audit and Safety Analysis
5	6	PE-III	EL	23EL1625	PE-III : Project Planning and Management
6	6	PE-III	EL	23EL1626	PE-III : Lab : Project Planning and Management
7	6	PE-III	EL	23EL1627	PE-III : Power Electronics Converters for Renewable Energy
8	6	PE-III	EL	23EL1628	PE-III : Lab : Power Electronics Converters for Renewable Energy
9	6	PE-III	EL	23EL1629	PE-III : Embedded System
10	6	PE-III	EL	23EL1630	PE-III : Lab : Embedded System
11	6	PE-III	EL	23EL1631	PE-III : PLC and Industrial Automation
12	6	PE-III	EL	23EL1632	PE-III : Lab : PLC and Industrial Automation

Professional Electives -IV

1	6	PE-IV	EL	23EL1641	PE-IV : Advanced Power Electronics
2	6	PE-IV	EL	23EL1642	PE-IV : Advanced Electrical Drives
3	6	PE-IV	EL	23EL1643	PE-IV : Grid Integration in Renewable Energy Systems
4	6	PE-IV	EL	23EL1644	PE-IV : Power System Operation and Management
5	6	PE-IV	EL	23EL1645	PE-IV : Microgrid
6	6	PE-IV	EL	23EL1646	PE-IV : Advanced Control System
7	6	PE-IV	EL	23EL1647	PE-IV : Environmental, Social, and Governance (ESG) frameworks in Industry 4.0

Coursera Elective

1	6	PE-IV	EL	23EL1648	PE-IV : Energy Production, Distribution and Safety
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Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
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 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
 B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
SEVENTH SEMESTER															
1	7	PC	EL	23EL1701	High Voltage Engineering	T	3	0	0	3	3	30	20	50	3 Hrs
2	7	PC	EL	23EL1702	Lab : High Voltage Engineering	P	0	0	2	2	1		60	40	
3	7	PC	EL	23EL1703	Switchgear & Protection	T	3	0	0	3	3	30	20	50	3 Hrs
4	7	PC	EL	23EL1704	Lab : Switchgear & Protection	P	0	0	2	2	1		60	40	
5	7	PC	EL	23EL1705	Electric Vehicles	T	3	0	0	3	3	30	20	50	3 Hrs
6	7	PC	EL	23EL1706	Lab : Electric Vehicles	P	0	0	2	2	1		60	40	
7	7	PE	EL		Professional Elective-V	T	3	0	0	3	3	30	20	50	3 Hrs
8	7	PE	EL		Lab : Professional Elective-V	P	0	0	2	2	1		60	40	
9	7	MDM	EL		MD Minor Course-V	T	2	0	0	2	2	30	20	50	3
10	7	STR	EL	23EL1707	Project Phase-II	P	0	0	8	8	4		60	40	
11	7	STR	EL	23EL1708	Campus Recruitment Training (CRT)	P	0	0	0	0	2			100	
12	7	STR	EL	23EL1709	Comprehensive Evaluation of Core Knowledge	P	0	0	2	2	1		60	40	
TOTAL							14	0	18	32	25				

Professional Electives -V

1	7	PE-V	EL	23EL1721	PE-V : Testing and Maintenance of Electrical Machines
2	7	PE-V	EL	23EL1722	PE-V : Lab : Testing and Maintenance of Electrical Machines
3	7	PE-V	EL	23EL1723	PE-V : Industrial Safety
4	7	PE-V	EL	23EL1724	PE-V : Lab : Industrial Safety
5	7	PE-V	EL	23EL1725	PE-V : Fundamentals of Power Quality
6	7	PE-V	EL	23EL1726	PE-V : Lab : Fundamentals of Power Quality
7	7	PE-V	EL	23EL1727	PE-V : FACTS Devices
8	7	PE-V	EL	23EL1728	PE-V : Lab : FACTS Devices
9	7	PE-V	EL	23EL1729	PE-V : Computer Methods in Power System
10	7	PE-V	EL	23EL1730	PE-V : Lab : Computer Methods in Power System
11	7	PE-V	EL	23EL1731	PE-V : Biomedical Instrumentation
12	7	PE-V	EL	23EL1732	PE-V : Lab : Biomedical Instrumentation

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 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
 B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
EIGHTH SEMESTER																
1	8	PE	EL		Professional Elective-VI	T	3	0	0	3	3	30		100		
2	8	MDM	EL		MD Minor Course-VI	T	2	0	0	2	2	30	20	50	3	
3	8	STR	EL	23EL1801	Internship / On Job training	P	0	0	18	18	7		60	40		
TOTAL							5	0	18	23	12					

GRAND TOTAL							120	0	88	214	176				
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Professional Electives - VI					
1	8	PE-VI	EL	23EL1821	PE-VI : Introduction to Fuzzy Logic Control and Neural Network
2	8	PE-VI	EL	23EL1822	PE-VI : Hybrid Electric Vehicles
3	8	PE-VI	EL	23EL1823	PE-VI : Fundamentals of Smart Grid
4	8	PE-VI	EL	23EL1824	PE-VI : EHVAC-HVDC Transmission
5	8	PE-VI	EL	23EL1825	PE-VI : Switched Mode Power Conversion
6	8	PE-VI	EL	23EL1826	PE-VI : Power System Reliability
6	8	PE-VI	EL	23EL1827	PE-VI : Agricultural Electricity Distribution System

Multidisciplinary Minor Courses				
		Track 1	Track 2	
Courses	Sem	Electric Vehicles	Solar Engineering	
MDM-I	3	(MDM1EL101) Introduction to Electric Vehicles	(MDM1EL201) Introduction to Solar -Thermal Energy	
MDM-II	4	(MDM2EL102) Energy storage devices	(MDM2EL202) Semi-conductor material for Solar Photovoltaic cells	
MDM-III	5	(MDM3EL103) Electric Machines	(MDM3EL203) Solar Power Plant Design	
MDM-IV	6	(MDM4EL104) Power Electronics and Motor drives	(MDM4EL204) Solar rooftop:Design and Installation	
MDM-V	7	(MDM5EL105) Drives and Autonomous Vehicle	(MDM5EL205) Technical and economic analysis of Solar PV	
MDM-VI	8	(MDM6EL106) Hybrid Electric Vehicle	(MDM6EL206) Applications of Solar Energy	

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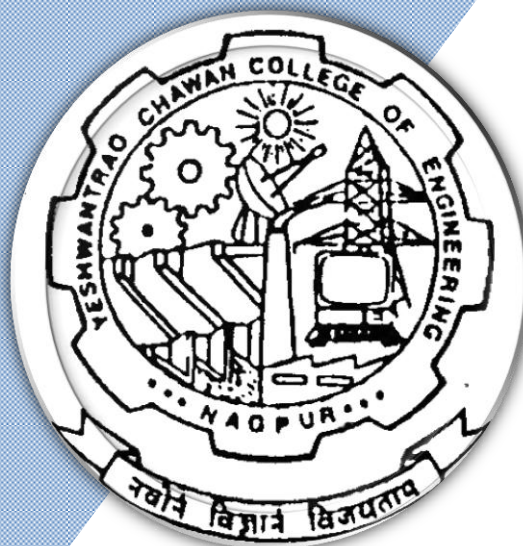
Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

1st Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
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B.TECH SCHEME OF EXAMINATION 2023
 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
 B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
FIRST SEMESTER (GROUP-B)																
1	1	BS	GE	23GE1102	Differential Equations, Matrices and Statistics	T	3	0	0	3	3	30	20	50	3	
2	1	BS	GE	23GE1108	Engineering Physics	T	3	0	0	3	3	30	20	50	3	
3	1	BS	GE	23GE1109	Lab : Engineering Physics	P	0	0	2	2	1		60	40		
4	1	BES	ME	23ME1101	Engineering Graphics	T	1	0	0	1	1	30	20	50	3	
5	1	BES	ME	23ME1102	Lab : Engineering Graphics	P	0	0	4	4	2		60	40		
6	1	BES	EL	23EL1101	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3	
7	1	BES	EL	23EL1105	Lab : Electrical and Electronics Workshop	P	0	0	2	2	1		60	40		
8	1	PC	EL	23EL1103	Fundamentals of Electrical Engineering	T	3	0	0	3	3	30	20	50	3	
9	1	PC	EL	23EL1104	Lab : Fundamentals of Electrical Engineering	P	0	0	2	2	1		60	40		
10	1	VSEC	GE	23GE1117	Get Set Go	---	---	---	---	---	2		60	40		
11	1	CC2	GE		Liberal Learning Course (LLC2)	---	---	---	---	---	2		60	40		
TOTAL FIRST SEM							13	0	10	23	22					

MANDATORY LEARNING COURSES

1	1	HS		GE2131	Universal Human Values (UHV)	A	2	0	0	2	0				
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SECOND SEMESTER (GROUP-B)

1	2	BS	GE	23GE1201	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1204	Applied Chemistry	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1205	Lab : Applied Chemistry	P	0	0	2	2	1		60	40	
4	2	HS/AEC 1	GE	23GE1212	Professional Communication	T	2	0	0	2	2	30	20	50	2
5	2	HS/IKS	GE	23GE1215	Indian Knowledge System	T	2	0	0	2	2	30	20	50	2
6	2	BES	CV	23CV1201	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3
7	2	BES	CV	23CV1202	Lab : Engineering Mechanics	P	0	0	2	2	1		60	40	
8	2	BES	IT	23IT1203	Programming for Problem Solving	T	2	0	0	2	2	30	20	50	2
9	2	BES	IT	23IT1204	Lab : Programming for Problem Solving	P	0	0	2	2	1		60	40	
10	2	VSEC	GE	23GE1218	Functional English	...	...	...	...	...	2		60	40	
11	2	CC1	GE		Liberal Learning Course (LLC1)	...	...	...	...	...	2		60	40	
TOTAL SECOND SEM							15	0	6	21	22				

MANDATORY LEARNING COURSES

1	2	HS		GE2301	Disaster Management and Preparedness	A	2	0	0	2	0				
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SoE No.
23EL-101

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							L	T	P	Hrs		MSEs*	TA**	ESE	
Liberal Learning Course															
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject										
1	2	CC2	GE	LLC1201	Music (Vocal)										
2	2	CC2	GE	LLC1202	Music (Instrumental)										
3	2	CC2	GE	LLC1203	Indian Classical Dance										
4	2	CC2	GE	LLC1204	Folk Dances										
5	2	CC2	GE	LLC1205	Painting										
6	2	CC2	GE	LLC1206	Theatre and acting										
7	2	CC2	GE	LLC1207	Photography										
8	2	CC2	GE	LLC1208	Yoga										
9	2	CC2	GE	LLC1209	Chess										
10	2	CC2	GE	LLC1210	Athletics										
11	2	CC2	GE	LLC1211	Basket Ball										
12	2	CC2	GE	LLC1212	Judo										
13	2	CC2	GE	LLC1213	Elements of Japanese Language										
14	2	CC2	GE	LLC1214	Elements of German Language										
15	2	CC2	GE	LLC1215	Elements of French Language										
16	2	CC2	GE	LLC1216	Elements of Spanish Language										
17	2	CC2	GE	LLC1217	Basics of Vedic Maths										
18	2	CC2	GE	LLC1218	Skillling in Microsoft Visio and Inkscape										
19	2	CC2	GE	LLC1219	Art of Public Speaking										
20	2	CC2	GE	LLC1220	Kabbadi										
21	2	CC2	GE	LLC1221	Kho-Kho										
22	2	CC2	GE	LLC1222	Volley Ball										
23	2	CC2	GE	LLC1223	Holistic Wellness										
24	2	CC2	GE	LLC1224	Nutrition and Diet										

Liberal Learning Course															
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject										
1	1	CC1	GE	LLC1101	Music (Vocal)										
2	1	CC1	GE	LLC1102	Music (Instrumental)										
3	1	CC1	GE	LLC1103	Indian Classical Dance										
4	1	CC1	GE	LLC1104	Folk Dances										
5	1	CC1	GE	LLC1105	Painting										
6	1	CC1	GE	LLC1106	Theatre and acting										
7	1	CC1	GE	LLC1107	Photography										
8	1	CC1	GE	LLC1108	Yoga										
9	1	CC1	GE	LLC1109	Chess										
10	1	CC1	GE	LLC1110	Athletics										
11	1	CC1	GE	LLC1111	Basket Ball										
12	1	CC1	GE	LLC1112	Judo										
13	1	CC1	GE	LLC1113	Elements of Japanese Language										
14	1	CC1	GE	LLC1114	Elements of German Language										
15	1	CC1	GE	LLC1115	Elements of French Language										
16	1	CC1	GE	LLC1116	Elements of Spanish Language										
17	1	CC1	GE	LLC1117	Basics of Vedic Maths										
18	1	CC1	GE	LLC1118	Skillling in Microsoft Visio and Inkscape										
19	1	CC1	GE	LLC1119	Art of Public Speaking										
20	1	CC1	GE	LLC1120	Kabbadi										
21	1	CC1	GE	LLC1121	Kho-Kho										
22	1	CC1	GE	LLC1122	Volley Ball										
23	1	CC1	GE	LLC1123	Holistic Wellness										
24	1	CC1	GE	LLC1124	Nutrition and Diet										

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : TA1-5 marks on Proctored Online Exam, TA2-12 marks on activitied decided by course teacher, TA3 - 3 marks on class attendance

TA** = for Practical : MSPA will be 15 marks each

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B. Tech SoE and Syllabus 2023
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(Department of Civil Engineering)

SoE No.
23FY-101

B.Tech in FYC

I SEMESTER

23GE1102 : Differential Equations, Matrices and Statistics

Course Outcomes	
The students will be able to	
1. Use appropriate Methods to solve first order and higher order differential equations and apply it to find solution of engineering problems. 2. Use Matrix method to solve linear system of equations, evaluate eigen values - eigen vectors and its applications. 3. Make use of probability distributions to solve real life problems. 4. Inspect scientific data, use proper curve fitting and find correlation, regression of variables.	
Unit I: Differential Equations I	(7 Hrs.)
Linear differential equations of first order and first degree, Differential equation reducible to linear form, Exact differential equations (excluding the case of integrating factor) and their applications to various fields. (Contemporary Issues related to Topic)	
Unit II: Differential Equations II	(7 Hrs.)
Higher order linear differential equations with constant coefficients, Complementary functions and Particular Integral for different cases, Method of variation of parameters, Examples on application to various fields. (Contemporary Issues related to Topic)	
Unit III: Differential Equations III	(6 Hrs.)
Cauchy's homogeneous linear differential equations, Legendre's linear differential equation, Applications of differential equations to various fields (only up to second order). (Contemporary Issues related to Topic)	
Unit IV: Partial Differential Equations	(6 Hrs.)
Partial Differential Equations of first order, first degree i.e. Lagrange's form, linear homogeneous equations of higher order with constant coefficient. Application of variable separable method to solve first and second order partial differential equations. (Contemporary Issues related to Topic)	
Unit IV: Matrices	(7 Hrs.)
Rank of a matrix, Consistency of system of equations using rank, Characteristics equations, Eigen values and Eigen vectors, Cayley Hamilton Theorem (without proof) statement and verification, Sylvester's theorem-statement and its application. (Contemporary Issues related to Topic)	
Unit VI: Statistics	(6 Hrs.)
Fitting of straight line, $y = a + bx$, a parabola $y = a + bx + cx^2$, exponential curves and power curves by method of least squares; Lines of regression and correlation; Rank correlation. (Contemporary Issues related to Topic)	
Total Lecture	39 Hours

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23FY-101

B.Tech in FYC

Textbooks:

1.	Erwin Kreyzig, Advance Engineering Mathematics, 6 th Edition, John Wiley and Sons, INC.
2.	H.K. Dass, Engineering Mathematics, 11 th revised edition, S. Chand, Delhi.
3.	H.K. Dass, Advanced Engineering Mathematics, 8 th revised edition, S. Chand, Delhi.
4.	Dr. B.S. Grewal, Higher Engineering Mathematics, 42 th edition, Khanna Publishers.
5.	P.N.Wartikar and J.N.Wartikar, Applied Mathematics, 4 th Edition, Vidyarthi GrihaPrakashan.

Reference Books:

1.	G B Thomas and R L Finney, Calculus and Analytical Geometry, 9th edition, Addison-Wesley, 1999.
2.	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 10 th edition, Laxmi Prakashan.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Mathematics%20and%20Humanities/
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MOOCs Links and additional reading, learning, video material

1.	https://nptel.ac.in/courses/111103070
2.	https://onlinecourses.nptel.ac.in/noc19_ma28/preview
3.	https://nptel.ac.in/courses/111/106/111106100/

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23FY-101

B.Tech in FYC

I SEMESTER

23GE1108 : Engineering Physics

Course Outcomes :

Upon successful completion of the course the students will be able to

1. Correlate fundamentals of quantum mechanics to solve problems dealing with quantum particles.
2. Assess the characteristics of semiconductor materials in terms of crystal structures, charge carriers and Energy bands.
3. Examine the intensity variation of light due to interference, diffraction, laser and its applications.
4. Analyze the motion of charged particles in electric and magnetic field and its applications to electron optic devices.
5. Illustrate the nature and characterization of magnetic materials and superconductors for engineering applications.

Unit I: Quantum Physics

(7 Hrs.)

Wave-particle duality, de-Broglie's hypothesis, Wave packet, Heisenberg's uncertainty principle: significance and applications, Wave function and its probability interpretation, Schrodinger Equation, Particle in infinite potential well. **(Contemporary Issues related to Topic)**

Unit II: Semiconductor Physics

(7 Hrs.)

Formation of energy bands in solids; Classification of solids, Energy band diagram of Si and Ge, Intrinsic and extrinsic semiconductors, Conductivity, Law of mass action, Fermi function, Fermi level in intrinsic and extrinsic semiconductors, Dependence of Fermi level on impurity concentration and temperature, Hall effect. **(Contemporary Issues related to Topic)**

Unit III: Geometrical Optics

(7 Hrs.)

Interference: Interference in thin films, Wedge shaped film, Newton's rings, Applications of interference
Diffraction: Fraunhofer diffraction from a single slit. **(Contemporary Issues related to Topic)**

Unit IV: Laser

(6 Hrs.)

Coherence and its types, Interaction of radiation with matter, Population Inversion, Pumping: methods and schemes, Optical resonant cavity, Ruby laser, Semiconductor diode laser, Properties and engineering applications of laser. **(Contemporary Issues related to Topic)**

Unit V: Electron Ballistics

(7 Hrs.)

Motion of a charged particle in uniform electric and magnetic field, Cross field configuration; Electron refraction, Electron lens. Cathode ray oscilloscope and its application. **(Contemporary Issues related to Topic)**

Unit VI: Magnetic Materials & Superconductors

(6 Hrs.)

Introduction to magnetic materials, Interpretation of Hysteresis curves, Superconductors: Type-I and Type-II, Meissner effect, Applications. **(Contemporary Issues related to Topic)**

Total Lecture 40 Hours

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Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech SoE and Syllabus 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Civil Engineering)

SoE No.
23FY-101

B.Tech in FYC

Textbooks

1	M. N. Avadhanulu, P.G.Kshirsagar, A Textbook of Engg. Physics, S.Chand and Company.
2	Hitendra K Malik , A K Singh , Engineering Physics, 2nd Edition, Tata McGraw Hill Education Private Limited,

Reference Books

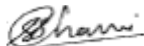
1	David Halliday, Robert Resnick and Jerle Walker, John-Wiley India, Fundamentals of Physics, 10 th John Wiley & Sons Inc.
2	Brijlal and Subramanyam, Text Book of Optics, Revised edition, S. Chand and Company.
3	M.N. Avadhanulu, 2 nd Edition, Laser, S.Chand and Company.
4	A.Beiser, Concept of Modern Physics, 6 th Edition, Laser, Tata McGraw-Hill.
5	Thyagarajan K. and Ghatak A.K, LASERS: Theory and Applications, 2 nd Edition, Macmillan Publication
6	S.O.Pillai, Solid State Physics, 9 th Edition, New Edge International Publishers.
7	Palanisamy, Solid State Physics, 8 th Edition, New Edge International Publishers.
8	C. Kittel, Solid State Physics, 8 th Edition, Wiley Publication.
9	B. K. Pandey, S. Chaturvedi, Engineering Physics, 1 st Edition, Cengage Learning.
10	John Allision, Electronic Engineering Materials and Devices, TMH edition, 10 th reprint, Tata McGraw Hill.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Physics/Eisberg%20&%20Resnick%20-%20Quantum%20Physics.pdf
2	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Physics/2016 Book ThePhysics OfSemiconductors.pdf
3	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Physics/Dekker%20-%20Solid%20State%20Physics.pdf

MOOCs Links and additional reading, learning, video material

1	https://nptel.ac.in/courses/115106066 - Quantum Physics
2	https://archive.nptel.ac.in/courses/115/105/115105121/ -CRO
3	www.digimat.in/nptel/courses/video/115102124/L36.html - Laser

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(Department of Civil Engineering)

SoE No.
23FY-101

B.Tech in FYC

I SEMESTER

23GE1109 : Lab. Engineering Physics

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Correlate fundamentals of quantum mechanics to solve problems dealing with quantum particles.
2. Assess the characteristics of semiconductor materials in terms of crystal structures, charge carriers and Energy bands.
3. Examine the intensity variation of light due to interference, diffraction, laser and its applications.
4. Analyze the motion in electric field and magnetic field and its applications to electron optic devices.
5. Illustrate the nature and characterization of magnetic materials and superconductors for engineering Applications.

List of Experiments :

Sr. No.	Experiments based on
1	Determination of Planck's constant.
2	Study of Tunnel Diode.
3	Determination of Hall coefficient and density of charge carriers using Hall effect.
4	Dependence of Hall coefficient on temperature.
5	Determination of Band gap in a semiconductor by four probe method.
6	Determination of Band gap in a semiconductor using reverse biased p-n junction diode.
7	Determination of radius of curvature of Plano convex lens using Newton's rings.
8	Determination of thickness of thin paper using air wedge.
9	Determination of wavelength of sodium light using diffraction grating.
10	Determination of wavelength of laser using diffraction grating.
11	Determination of divergence of laser beam.
12	Determination of amplitude and frequency of sinusoidal signal using CRO.
13	To measure the phase shift introduced by a phase shift network using Dual beam CRO.
14	Determination of the velocity of Ultrasonic waves in a non -electrolytic liquid by ultrasonic interferometer.

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(Department of Mechanical Engineering)

B.Tech in Mechanical Engineering

**SoE No.
23ME-101**

I SEMESTER

23ME1101 : Engineering Graphics

Course Outcomes :

Upon successful completion of the course the students will be able to

1. Construct orthographic drawing and isometric drawing of a given object
2. Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects
3. Develop the lateral surfaces of various solids, their section and intersection.
4. Practice the use of software tools used for Two dimensional drawings.

Unit I: Theory of Orthographic Projections:

(3 Hrs.)

Introduction, Quadrant system, Theory of orthographic projection, Projection method and principal planes, First and Third angle projections,

Unit II: Theory of Isometric Projections:

(2 Hrs.)

Theory of isometric projection, Method for drawing isometric views, Different problems on isometric projections.

Unit III: Lines:

(2 Hrs.)

Projection of points, Projection of lines, True lengths and inclinations, apparent lengths and inclinations, various positions of lines in different quadrants, Traces of lines, projection of line on auxiliary plane.

Unit IV: Planes and Solids:

(4 Hrs.)

Projection planes: (Polygonal Lamina, Circular Lamina), Projection of Perpendicular planes and oblique planes. Auxiliary views (Auxiliary planes) Projection of Solids :(Inclined to One Plane Only) - Polyhedra (Regular and Irregular Polyhedra), Solids of Revolution

Unit V: Section of Solids and Development of Surfaces:

(2 Hrs.)

Types of Section planes, Sectional top view, True shape.
Development of different solids using Radial line and parallel line methods.

Unit VI: Intersection of Surfaces of solids:

(2 Hrs.)

Intersection between similar solids, Intersection between dissimilar solids, Lines and Curves of Intersection.

Total Lecture 15 Hours

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B. Tech SoE and Syllabus 2023

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(Department of Mechanical Engineering)

B.Tech in Mechanical Engineering

SoE No.
23ME-101

Textbooks:

- | | |
|----|--|
| 1. | D.M. Kulkarni, A. P. Rastogi and A. K. Sarkar , Engineering Graphics with AutoCAD PHI learning Pvt. Ltd., Revised Edition(2014), |
| 2. | N. D. Bhatt ,Engineering Drawing Charotar Publishing House Pvt. Ltd, 53 rd Edition 2017 |

Reference Books:

- | | |
|----|---|
| 1. | D. A. Jolhe Engineering Drawing , Tata McGraw Hill Publications , 2008, |
| 2. | K. L. Narayana & P. Kannaiah , Engineering Drawing SciTech Publication , 2010 |
| 3. | R. K. Dhawan Engineering Drawing S. Chand Publication Multicolor revised edition 2015 |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- | | |
|---|--|
| 1 | Intranet on address 172.16.1.10. data/CCC/software / AutoCAD Software Setup. |
|---|--|

MOOCs Links and additional reading, learning, video material

- | | |
|----|---|
| 1. | https://youtube.com/playlist?list=PLLy_2iUCG87Bw9XPfEF3r3EW5UIAOv8iz |
| 2. | Eng https://nptel.ac.in/courses/112105294 |

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(Department of Mechanical Engineering)

B.Tech in Mechanical Engineering

**SoE No.
23ME-101**

I SEMESTER

23ME1102 : Lab. Engineering Graphics

Course Outcomes :

Upon successful completion of the course the students will be able to

1. Construct orthographic drawing and isometric drawing of a given object
2. Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects
3. Develop the lateral surfaces of various solids, their section and intersection.
4. Practice the use of software tools used for Two dimensional drawings.

Practical's to be performed from the list as below

SN	Experiments based on	No.of Practical's
1	Introduction of AutoCAD Basic Commands	02
2	Orthographic Projection	03
3	Isometric Projection	03
4	Projection of Straight Line	03
5	Projection of Planar Surface	03
6	Projection of Solid	03
7	Section and Development of Solid	04
8	Intersection of Surfaces	03
9	Drawing Sheet 1: Convention for various lines, Dimensioning and Orthographic Projection	02
10	Drawing Sheet 2: Projection of line, planar surface or solid. (Any one)	02
Total Practical's		28 Hours

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

I SEMESTER

23EL1101 : Basic Electrical and Electronics Engineering

Course Outcomes:

1. Understand the fundamental concepts of Analog Electronic and Electrical Circuits
2. Apply the concepts of Electrical and Electronic Circuits to obtain the desired parameter
3. Analyze analog Electrical Circuits for given application.
4. Analyze analog Electronic Circuits for given application

Unit I: Circuit Elements and Energy Sources

(8 Hrs.)

DC Circuits - Circuit Elements, Series and Parallel Combination of Resistances, Equivalent Resistance, Star-Delta Connection, Energy Sources, Source Transformation, Kirchhoff's Laws, Current Division, Voltage Division, Nodal and Mesh Analysis of Electric Circuits, (Contemporary Issues related to Topic)

Unit II: Analysis of Network

(8Hrs.)

AC Circuits –Resistance, Inductance and Capacitance, Sources with Periodic Waveforms, A.C. in Resistance, Inductance and Capacitance, Series – Parallel AC circuits

(Contemporary Issues related to Topic)

Unit III: Generator and Motors

(8 Hrs.)

Introduction to Generator, Construction, working principle, Types of Generators, Introduction to DC Motor, Working Principle of DC Motor, Types of Motors. Introduction to transformer, Introduction to Induction Motors - Construction, working principle, Types.

(Contemporary Issues related to Topic)

Unit IV: Diode and Transistor

(7 Hrs.)

Introduction to Semiconductor, P-N junction diodes, Biasing & Characteristics of diodes. Diode Circuits - Half wave rectifier, full wave rectifier, bridge rectifier. Introduction to BJT- NPN and PNP, Modes of operation,. (Contemporary Issues related to Topic)

Unit V: Operational Amplifier and Its Application

(7 Hrs.)

Introduction to Op-Amp, Inverting and Non-Inverting Amplifier, Linear Applications of OP-AMP like adder, Subtractor, integrator, differentiator and non-linear application using Comparator.

(Contemporary Issues related to Topic)

Unit VI: Electronics Measurement

(7 Hrs.)

Introduction to Measurement System, Generalized block diagram of Measurement System, Static & Dynamic characteristics of measurement system, Types of errors & their sources, Statistical analysis, Electromechanical Instruments (PMMC)

(Contemporary Issues related to Topic)

Total Lecture 45 Hours

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B.Tech in Electrical Engineering

SoE No.
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Textbooks:

- | | |
|----|--|
| 1. | Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford Higher Education, First Edition 2005 |
| 2. | Electronics Devices and circuits, Millman Jacob, McGraw Hill Education, Fourth Edition (2015) |
| 3. | Circuit Theory (Analysis and Synthesis), by A. Chakrabarti, Dhanpat Rai & Co., Reprint Edition 2014 |

Reference Books:

- | | |
|----|--|
| 1. | OP-AMP and Linear Integrated Circuit, by Ramakant A. Gayakwad, Prentice Hall India Learning Private Limited, Published in 2002 |
| 2. | Electrical & Electronic measurement & Instrument, A. K. Sawhney, Dhanpat Rai & Co., 18th edition 2008 |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- | | |
|---|---|
| 1 | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| 2 | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |

MOOCs Links and additional reading, learning, video material

- | | |
|----|---|
| 1. | https://onlinecourses.nptel.ac.in/noc22_ee113/preview |
|----|---|

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

I SEMESTER

23EL1105 : Lab : Electrical and Electronics Workshop

Course Outcomes:

Upon successful completion of the course the students will be able

1. To choose the electrical and electronics components/equipment for various application
2. To select various sensors and measuring instruments for different applications.
3. To build the various electrical wiring for different application

Sr. No.	Experiments based on
1	Introduction of Tools, Electrical Materials and Electrical Drawing Symbols
2	Introduction to basic Electrical Components (R, L, C) with its number and color coding.
3	Introduction to Different types of Measuring Instruments and its demonstration.
4	To implement 12 V DC power supply using 7812 IC
5	Fabrication of four switch socket Electrical Distribution Board
6	To fabricate Staircase Wiring and Godown Wiring
7	Fabrication of solar powered electric fan
8	To monitor the output voltage of solar panel using voltage Sensor
9	Introduction to Different sensor devices and its demonstration.
10	To Study different protection devices and Importance of Earthing.

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

I SEMESTER

23EL1103 : Fundamentals of Electrical Engineering

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Reproduce fundamentals of dc circuits, magnetic circuits, single phase, and three phase ac circuits.
2. Compute basic electrical and magnetic quantities for electrical and magnetic circuits respectively.
3. Explain construction, working, testing, and applications of single-phase transformers.

Unit I: D. C. Circuits

(7 Hrs.)

Basics of electrical circuits, Equivalent resistance, Kirchhoff's Laws. Current and Voltage division rule. Mesh and Nodal analysis of dc circuits. Superposition theorem. **(Contemporary Issues related to Topic)**

Unit II: Electromagnetism & Magnetic Circuits

(6 Hrs.)

Magnetic Field, Magnetic Flux, Magnetic Flux Density, Permeability, Relation between magnetic flux density and field intensity, Magnetic field due to current carrying conductor and a coil. Right hand grip rule, Force on a current carrying conductor placed in a magnetic field, Magnetomotive Force, Magnetic Field Strength. Reluctance, Magnetization curves of magnetic materials, Magnetic hysteresis and hysteresis loss. Eddy current and eddy current loss, Leakage flux and fringing, Faraday's laws of electromagnetic induction, Lenz's Law, Types of induced EMF, Magnetic Circuits **(Contemporary Issues related to Topic)**

Unit III: A.C. Fundamentals & Single-Phase Series A. C. Circuits

(7 Hrs.)

Generation of alternating voltage. Values of alternating quantity. Average and rms value by mid – ordinate method and method of integration. Form factor and peak factor. Concept of phasor and its mathematical representation. Concept of phasor diagram. Phasor algebra. Power in a.c. circuit. Concept of power factor, reactive power and apparent power with power triangle.

Analysis of purely resistive (R), inductive (L), and capacitive (C) circuits. Concept of inductive and capacitive reactance.

Analysis of series R – L, R – C, and R – L – C circuits for voltages and current, their waveforms, phasor diagram, impedance triangle, power factor. Series resonance. **(Contemporary Issues related to Topic)**

Unit IV: Single Phase Parallel & Series – Parallel A. C. Circuits

(6 Hrs.)

Concept of conductance, susceptance and admittance. Admittances in series and parallel. Analysis of single phase parallel and series – parallel a.c. circuits with their phasor diagram. Parallel resonance. **(Contemporary Issues related to Topic)**

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Unit V: Three Phase A.C. Circuits	(7 Hrs.)
Advantages of three – phase systems over single – phase systems. Generation of three phase a.c. supply. Phase sequence. Interconnection of three phases. Star or Wye connection. Phase and line voltages/currents in star connection and their relationships. Delta or Mesh connection. Phase and line voltages/currents in delta connection and their relationships. Concept of balanced load. Active, reactive, and apparent power in balanced three phase circuits. (Contemporary Issues related to Topic)	
Unit VI: Single Phase Transformer	(6 Hrs.)
Working principle. EMF equation. Voltage ratio and turns ratio. Step up and step-down transformers. Construction of a single-phase transformer. Types of transformers and their applications. Ideal transformer. Transformer on no load with phasor diagram and equivalent circuit. Practical transformer and its equivalent circuit. Referred values. Transformer on load with phasor diagram and equivalent circuit. Voltage Regulation. Losses in transformer. Load Test. Open circuit and Short circuit tests on transformers. Efficiency and condition for maximum efficiency. Autotransformer operation, kVA rating of autotransformer (Contemporary Issues related to Topic)	
Total Lecture	39 Hours

Textbooks:

1.	D. C. Kulshreshtha , “Basic Electrical Engineering” ,Tata McGraw - Hill Education Private Limited.
2.	T. K. Nagsarkar , M. S. Sukhija , “Basic Electrical Engineering” , Oxford University Press , Third Edition.

Reference Books:

1.	V. N. Mittle , Arvind Mittal , “Basic Electrical Engineering” , Tata McGraw - Hill Publishing Company Limited , Second Edition.
2.	B. L. Theraja , A. K. Theraja , “A Text Book Of Electrical Technology Volume I & II” , S. Chand & Company Pvt. Ltd. , Twenty Third Edition.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://link.springer.com/openurl?genre=book&isbn=978-3-540-43965-3
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MOOCs Links and additional reading, learning, video material

1.	Course on Basic Electrical Technology By Prof. Dr. L. Umanand https://archive.nptel.ac.in/courses/108/108/108108076
2.	Course on Fundamentals Of Electrical Engineering By Prof. Debapriya Das https://nptel.ac.in/courses/108105112
3.	Course on Basic Electrical Technology By Prof. N.K. De, Prof. G.D. Roy, Prof. T.K. Bhattacharya https://nptel.ac.in/courses/108105053

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

I SEMESTER

23EL1104 : Lab. Fundamentals of Electrical Engineering

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Reproduce fundamentals of dc circuits, magnetic circuits, single phase, and three phase ac circuits.
2. Compute basic electrical and magnetic quantities for electrical and magnetic circuits respectively.
3. Explain construction, working, testing, and applications of single-phase transformers.
4. Determine performance of single-phase transformers.
5. Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicating and presenting effectively through laboratory journals.

SN	Experiments based on
1	To verify Kirchhoff's voltage law and Kirchhoff's current law.
2	To study R - L - C series circuit.
3	To verify Superposition theorem.
4	To study R - L - C parallel circuit.
5	To study balanced three phase star (Y) connected load.
6	To find transformation ratio, regulation, and efficiency of a single-phase transformer by direct loading.
7	To study balanced three phase delta (Δ) connected load.
8	To perform open circuit test and short circuit test on a single-phase transformer.
9	To draw B - H curve of a magnetic material.

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SoE No.
23FY-101

B.Tech in FYC

I SEMESTER

23GE1117-Get Set Go

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Students will understand the importance of building trust in communication and learn how to use the 3Vs of communication (Visual, Vocal, Verbal) to energize their interactions.
2. The course will focus on leadership principles and styles, emphasizing how effective communication can motivate others and gain willing cooperation. Students will participate in activities like skits and team presentations to demonstrate their leadership skills.
3. The course will equip students with team management and organization skills, enabling them to lead and participate in team-building activities effectively.

Unit:1	Build a foundation for success	6 Hours
Explain the Importance of Process of improvement, stating your Name with Impact, Recall and Use Names, Name Remembering Formula o LIRA o PACE – Individual Activity o BRAMMS o Chaining Method, Introduce “My Vision” Communication Fundamentals for Building Trust- Be a good listener, use conversation links, show genuine interest Hi-Five of Success ♣ Build on Memory Skills and Enhance Relationships ♣ PEG words ♣ Explain Permanent PEG Memory System, energize our Communications – Explain 3Vs of communication – Visual-Vocal-Verbal Activity – Practice Conversations, Pause-Part-Punch, Group Activity		
Unit:2	Increase Self Confidence	6 Hours
Use our experiences to communicate more confidently • Communicate with clarity and conciseness • Discover how past experiences influence behaviour ,Motivate Others and Enhance Relationships- • Learning Objectives • Explain Gain Willing Cooperation Principles • Group Presentation • Explain Demonstration of Leadership Principles • Explain “Evidence” critical in establishing credibility Individual Activity – Sharing of defining moment, Skit to demonstrate Leadership Principles, Stranded on Island .		
Unit:3	Fundamentals of Communication	6 Hours
Fundamentals of Communication (Earn the right – Excite -Eagerness) ♣ Elevator Pitch ♣ Develop more Flexibility, ♣ Recap and Summarize Activities - – Individual Presentation, Flexibility Drills, Individual Presentations – My Vision Assignment		
Unit:4	Team Management and Organization skills	5 Hours
Team Management and Organization skills, Leadership Styles, Effective Communication Activity- Team Presentation, Team building activities.		
EVALUATION	1 Hour	EVALUATION
WRITTEN TEST		
Total Lecture Hours		24 Hours

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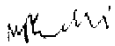
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23FY-101

B.Tech in FYC

Reference Books

- | | |
|---|---|
| 1 | Soft Skills - Enhancing Employability: Connecting Campus with Corporate. - M S Rao |
| 2 | Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H Wentz |
| 3 | Soft Skills: Know Yourself and Know the World - Alex |

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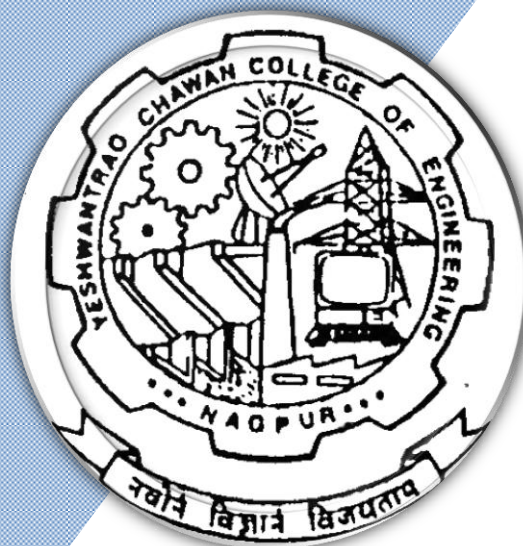
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Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

2nd Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
 (An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.TECH SCHEME OF EXAMINATION 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

**SoE No.
23EL-101**

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FIRST SEMESTER (GROUP-B)															
1	1	BS	GE	23GE1102	Differential Equations, Matrices and Statistics	T	3	0	0	3	3	30	20	50	3
2	1	BS	GE	23GE1108	Engineering Physics	T	3	0	0	3	3	30	20	50	3
3	1	BS	GE	23GE1109	Lab : Engineering Physics	P	0	0	2	2	1		60	40	
4	1	BES	ME	23ME1101	Engineering Graphics	T	1	0	0	1	1	30	20	50	3
5	1	BES	ME	23ME1102	Lab : Engineering Graphics	P	0	0	4	4	2		60	40	
6	1	BES	EL	23EL1101	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
7	1	BES	EL	23EL1105	Lab : Electrical and Electronics Workshop	P	0	0	2	2	1		60	40	
8	1	PC	EL	23EL1103	Fundamentals of Electrical Engineering	T	3	0	0	3	3	30	20	50	3
9	1	PC	EL	23EL1104	Lab : Fundamentals of Electrical Engineering	P	0	0	2	2	1		60	40	
10	1	VSEC	GE	23GE1117	Get Set Go	...	...	...	...	...	2		60	40	
11	1	CC2	GE		Liberal Learning Course (LLC2)	...	...	...	...	...	2		60	40	
TOTAL FIRST SEM							13	0	10	23	22				

MANDATORY LEARNING COURSES

1	1	HS		GE2131	Universal Human Values (UHV)	A	2	0	0	2	0				
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SECOND SEMESTER (GROUP-B)

1	2	BS	GE	23GE1201	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1204	Applied Chemistry	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1205	Lab : Applied Chemistry	P	0	0	2	2	1		60	40	
4	2	HS/AEC 1	GE	23GE1212	Professional Communication	T	2	0	0	2	2	30	20	50	2
5	2	HS/IKS	GE	23GE1215	Indian Knowledge System	T	2	0	0	2	2	30	20	50	2
6	2	BES	CV	23CV1201	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3
7	2	BES	CV	23CV1202	Lab : Engineering Mechanics	P	0	0	2	2	1		60	40	
8	2	BES	IT	23IT1203	Programming for Problem Solving	T	2	0	0	2	2	30	20	50	2
9	2	BES	IT	23IT1204	Lab : Programming for Problem Solving	P	0	0	2	2	1		60	40	
10	2	VSEC	GE	23GE1218	Functional English	...	...	...	...	...	2		60	40	
11	2	CC1	GE		Liberal Learning Course (LLC1)	...	...	...	...	...	2		60	40	
TOTAL SECOND SEM							15	0	6	21	22				

MANDATORY LEARNING COURSES

1	2	HS		GE2301	Disaster Management and Preparedness	A	2	0	0	2	0				
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Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
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B.TECH SCHEME OF EXAMINATION 2023
 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
Liberal Learning Course															
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject										
1	2	CC2	GE	LLC1201	Music (Vocal)										
2	2	CC2	GE	LLC1202	Music (Instrumental)										
3	2	CC2	GE	LLC1203	Indian Classical Dance										
4	2	CC2	GE	LLC1204	Folk Dances										
5	2	CC2	GE	LLC1205	Painting										
6	2	CC2	GE	LLC1206	Theatre and acting										
7	2	CC2	GE	LLC1207	Photography										
8	2	CC2	GE	LLC1208	Yoga										
9	2	CC2	GE	LLC1209	Chess										
10	2	CC2	GE	LLC1210	Athletics										
11	2	CC2	GE	LLC1211	Basket Ball										
12	2	CC2	GE	LLC1212	Judo										
13	2	CC2	GE	LLC1213	Elements of Japanese Language										
14	2	CC2	GE	LLC1214	Elements of German Language										
15	2	CC2	GE	LLC1215	Elements of French Language										
16	2	CC2	GE	LLC1216	Elements of Spanish Language										
17	2	CC2	GE	LLC1217	Basics of Vedic Maths										
18	2	CC2	GE	LLC1218	Skilling in Microsoft Visio and Inkscape										
19	2	CC2	GE	LLC1219	Art of Public Speaking										
20	2	CC2	GE	LLC1220	Kabbadi										
21	2	CC2	GE	LLC1221	Kho-Kho										
22	2	CC2	GE	LLC1222	Volley Ball										
23	2	CC2	GE	LLC1223	Holistic Wellness										
24	2	CC2	GE	LLC1224	Nutrition and Diet										

Liberal Learning Course															
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject										
1	1	CC1	GE	LLC1101	Music (Vocal)										
2	1	CC1	GE	LLC1102	Music (Instrumental)										
3	1	CC1	GE	LLC1103	Indian Classical Dance										
4	1	CC1	GE	LLC1104	Folk Dances										
5	1	CC1	GE	LLC1105	Painting										
6	1	CC1	GE	LLC1106	Theatre and acting										
7	1	CC1	GE	LLC1107	Photography										
8	1	CC1	GE	LLC1108	Yoga										
9	1	CC1	GE	LLC1109	Chess										
10	1	CC1	GE	LLC1110	Athletics										
11	1	CC1	GE	LLC1111	Basket Ball										
12	1	CC1	GE	LLC1112	Judo										
13	1	CC1	GE	LLC1113	Elements of Japanese Language										
14	1	CC1	GE	LLC1114	Elements of German Language										
15	1	CC1	GE	LLC1115	Elements of French Language										
16	1	CC1	GE	LLC1116	Elements of Spanish Language										
17	1	CC1	GE	LLC1117	Basics of Vedic Maths										
18	1	CC1	GE	LLC1118	Skilling in Microsoft Visio and Inkscape										
19	1	CC1	GE	LLC1119	Art of Public Speaking										
20	1	CC1	GE	LLC1120	Kabbadi										
21	1	CC1	GE	LLC1121	Kho-Kho										
22	1	CC1	GE	LLC1122	Volley Ball										
23	1	CC1	GE	LLC1123	Holistic Wellness										
24	1	CC1	GE	LLC1124	Nutrition and Diet										

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : TA1-5 marks on Proctored Online Exam, TA2-12 marks on activitied decided by course teacher, TA3 - 3 marks on class attendance

TA** = for Practical : MSPA will be 15 marks each

 Chairperson		 Dean (Acad. Matters)		July, 2023	1.00	Applicable for AY 2023-24 Onwards
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B. Tech SoE and Syllabus 2023
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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

II SEMESTER

23GE1201: Calculus and Vector

Course Outcomes :

The students will be able to

1. Apply the knowledge of differentiation to solve the Engineering problems.
2. Determine the derivatives of functions of several variables and develop the relations among the derivatives of variables.
3. Apply the knowledge of Beta and Gamma functions to find area, volume and mass.
4. Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single and multiple variables.

Unit I: Differential Calculus	(6 Hrs.)
Successive differentiation, n^{th} derivative of rational function, Trigonometrical transformations, n^{th} derivative of the product of two functions (Leibnitz's theorem), Taylor's theorem, Use of Maclaurin's theorem for one variable, standard expansions, Examples on Taylor's Theorem. (Contemporary Issues related to Topic)	
Unit II: Partial Differentiation	(7 Hrs.)
Functions of several variables, First and higher order derivatives, Homogeneous functions, Euler's theorem on homogeneous function, Chain rule and total differential coefficient of composite functions. Jacobians. (Contemporary Issues related to Topic)	
Unit III: Integral Calculus	(6 Hrs.)
Improper integrals: Gamma and Beta functions, applications of integral calculus in computing area, length, volumes, and surface of solids of revolutions. (Contemporary Issues related to Topic)	
Unit IV: Multiple integrals	(6 Hrs.)
Double integral, change of order of integral, change of variables, triple integrals and its applications. (Contemporary Issues related to Topic)	
Unit V: Vector Calculus	(7 Hrs.)
Vector fields, Vector differentiation, Gradient, Divergence and Curl, Directional derivatives with physical interpretation, Solenoidal and irrotational motions. (Contemporary Issues related to Topic)	
Unit VI: Vector Integration & Applications	(7 Hrs.)
Vector integration: Line, surface and volume integrals, Statement of Stoke's theorem, Gauss divergence theorem and Green's theorem (without proof), Simple applications of these theorems. (Contemporary Issues related to Topic)	
Total Lecture	39 Hours

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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

Textbooks:

1. Erwin Kreyzig, Advance Engineering Mathematics, 10th Edition, John Wiley and Sons, INC.
2. H.K. Dass, Engineering Mathematics, 11th revised edition, S. Chand, Delhi.
3. H.K. Dass, Advanced Engineering Mathematics, 8th revised edition, S. Chand, Delhi.
4. Dr. B.S. Grewal, Higher Engineering Mathematics, 42th edition, Khanna Publishers.
5. P.N.Wartikar and J.N.Wartikar, Applied Mathematics, 4th Edition, Vidyarthi GrihaPrakashan.

Reference Books:

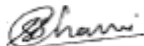
1. G B Thomas and R L Finney, Calculus and Analytical Geometry, 9th edition, Addison-Wesley, 1999.
2. Michael Spivak and Tom Apostol, Calculus, Vol I & Vol II 2nd edition, Wiley.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 10th edition, Laxmi Prakashan.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1. <http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Mathematics%20and%20Humanities/>

MOOCs Links and additional reading, learning, video material

1. <https://nptel.ac.in/courses/111/106/111106146/>
2. <https://nitkkr.ac.in/docs/5-Multiple%20Integrals%20and%20their%20Applications.pdf>

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B. Tech SoE and Syllabus 2023
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(Department of Chemistry)
B.Tech First Year

SoE No.
23FY-101

I/II SEMESTER

23GE1104/23GE1204: Applied Chemistry

Course Outcomes:

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

1. **Build** the knowledge of qualitative and quantitative aspects of water for industrial and domestic applications. (L3)
2. **Apply** fundamental principles of electrochemistry to understand corrosion, energy storage devices and their industrial applications. (L3)
3. **Develop** insight into engineering materials for industrial applications. (L3)
4. **Utilize** knowledge of advanced engineering materials for technological applications. (L3).

Unit I: Water Chemistry

(8 Hrs.)

Introduction, Potable water quality parameters. Hardness, Types of hardness. Sterilization. Desalination of water by R.O. Softening of water by Zeolite process and Ion Exchange Process (principle, advantages, and limitations). Numerical based on Hardness and Zeolite process. Boiler trouble (Scale and sludge).

Contemporary issues related to the topic

Unit II: Electrochemistry

(8 Hrs.)

Introduction, Redox reactions, EMF of a cell, standard electrode potential, Nernst equation, numerical and applications to chemical cells. Conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Electrolysis, laws of electrolysis and numerical.

Industrial applications: Electroplating, Electrolytic refining.

Corrosion: Definition, Causes, theories of corrosion- dry, wet and differential aeration.

Contemporary issues related to the topic

Unit III: Energy storage devices

(7 Hrs.)

Battery: Introduction, Characteristics, and General applications

Lithium-ion battery, Glass battery, H₂-O₂ Fuel cell. Differences between Battery and Fuel cell. Recycling and safe disposal of batteries.

Supercapacitors: Definition, Types, Characteristics, and Application.

H₂ as a green fuel: Introduction, Production, Storage, and Utilization. Contemporary issues related to the topic

Unit IV: Fuels

(8 Hrs.)

Introduction, Calorific value, HCV & LCV. Determination of calorific value of fuels by Bomb & Boy's calorimeter. Dulong's formula Numerical.

Significance of Proximate and Ultimate analysis.

Knocking in Internal combustion petrol and diesel engines, Octane and Cetane number, Knocking and its relationship with structure of fuels. Catalytic cracking & advantages. Contemporary issues related to the topic

Unit V: Engineering Materials

(7 Hrs.)

Cement: Introduction, Manufacturing of Portland cement. Role of microscopic constituents. Properties-setting and hardening, heat of hydration and soundness. Types of cement-Rapid hardening cement, Low heat cement, High alumina cement. Ready-mix concrete.

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**SoE No.
23FY-101**

Lubricants: Introduction, Classification, Mechanism of Lubrication.
Properties & Significance of liquid lubricants–Viscosity and viscosity index, Flash and fire point, Cloud and pour point, Aniline point, acid value, saponification number. Numerical on V.I. Contemporary issues related to the topic.

Unit VI: Advanced Materials	(7 Hrs.)
Nanomaterials: Definition, Carbon Nanotubes and types. Applications of Nanomaterials in Electronics, Environment and Medicine. Liquid Crystal Polymers: Introduction, General properties and applications. Polymers in electronic industries: Introduction, Piezo, pyroelectric, Ferroelectric polymers. Smart materials: Introduction, Properties and applications of Chromoactive, Photoactive and Magneto rheological materials. Spectroscopic techniques: Introduction and applications. Contemporary issues related to the topic	
Total Lecture	45 Hours

Textbooks:

1.	S S. Dara , A Text book of Engineering Chemistry , S.Chand & Co New Delhi. Eleventh Edition.
2.	P.C. Jain and Monica Jain , Engineering Chemistry , Dhanpat Rai & sons New Delhi , Sixteenth Edition.
3.	P. W. Atkins, Physical Chemistry ,Oxford Publications, Eighth edition .

Reference Books:

1.	Eskel Nordell , Water treatment for industrial and other use ,Rein hold Publishing Corporation, New York.
2.	Lloyd A.Munro, Chemistry in Engineering, Prentice-hall, Inc Nj, 2nd Edition.
3.	Robert B Leighou Mc Graw, Chemistry of Engineering Materials, Hill Book Company, Inc New York.
4.	B.K.Sharma Krishna, Engineering Chemistry, Prakashan media private LTD. 1st Edition, 2014.
5.	R.V.Gadag, A.Nityananda Shetty, Engineering Chemistry ,I K International Publishing House New Delhi , First Edition.
6.	Fred. Billmeyer Jr., A textbook of polymer science, Wiley India ,Third Edition.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/SERIES%20WISE%20BOOKS/CHEMISTRY/
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MOOCs Links and additional reading, learning, video material

1.	https://www.youtube.com/watch?v=XTt3gXB0a84
2.	https://www.youtube.com/watch?v=iihYXx79QiE
3.	https://www.youtube.com/watch?v=JfJ7MIP9Dco
4.	https://www.youtube.com/watch?v=L2VSOccUrSk
5.	https://www.youtube.com/watch?v=p5pk4Um6lsk
6.	https://youtu.be/-R7s17hD104
7.	https://youtu.be/Bmj85Ihfv7w

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(Department of Applied Chemistry)

B.Tech First Year

SoE No.
23FY-101

I/II SEMESTER

23GE1105/23GE1205: Applied Chemistry Lab

Course Objectives (PR)

- 1) Develop analytical ability.
- 2) Integrate chemistry fundamentals with practical applications.

Course Outcomes

Upon successful completion of the course the students will be able to

1. **Apply** the knowledge of quantitative and qualitative chemical analysis to perform record and analyze the results. (L3)
2. **Experiment** with instrumental and analytical techniques in Chemistry to solve engineering problems related to sustainability. (L3)
3. **Write** effective reports and communicate through oral presentations. (L3)
4. **Review** and apply laboratory safety protocols and procedures to acquire the ability for independent and lifelong learning. (L3)

Total 9 experiments are to be performed

(4 each from Lab I and Lab II and one demonstration experiment)

SN	Experiments based on
	List of Experiments-Lab- I
1	Estimation of Nickel.
2	Estimation of Fe^{2+} ions by redox titration
3	Determination of copper by iodometric titration
4	Determination of Cation exchange capacity of an ion exchange resin
5	To determine the strength of a given potassium dichromate solution with N/20 sodium thiosulphate solution
6	Determination of COD of water sample.
	List of Experiments-Lab- II
1	Determination of viscosity of lubricating oil by Redwood Viscometer I or II
2	Determination of molecular weight of a polymer.
3	Proximate analysis of coal

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B.Tech in CV/ME/EE/EL/ETC/VLSI

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4	Determination of electrochemical equivalence of copper using Faradays Law
5	Determination of strength of the given acid conductometrically.
6	To verify Beer-Lambert law for KMnO_4 calorimetrically and determine the concentration of the given solution of KMnO_4 .
	List of Demonstration Experiments
1	Synthesis of urea formaldehyde.
	Advanced Topics (CBS)
1.	To Determine optimum alum dosage for water or wastewater treatment by turbidity measurement using nephelometer and residual chlorine testing using chloroscope.
2.	Comparative study of effects of different drying techniques on the quality of fruits and vegetables.

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B. Tech SoE and Syllabus 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

II SEMESTER

23GE1212 : Professional Communication

Course Outcomes :

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

1. Apply different modes for effective communication
2. Produce competently the Phonology of English language
3. Apply nuances of LSRW skills
4. Practice Communication through different channels

Unit I: Basics of Communication

(6 Hrs.)

Process of Communication, Levels of Communication, Flow of Communication, Networks of Communication, Classification of Barriers (Intrapersonal, Interpersonal, Organizational).

Unit II: English Phonetics

(7 Hrs.)

Speech Mechanism, Organs of speech, Consonant and Vowels sounds symbols, word stress rules

Unit III: Presentation & Interview Skills

(6 Hrs.)

Presentation-Nuances of presentation- Kinesics, Proxemics, Chronemics, Vocalics, Modes of Presentation,

Interview-Purpose, expectations of employer and preparation for Interview, Types, Types of Questions & Answering Techniques, Telephonic Interviews – preparation and guidelines

Unit IV: Technical Reports, Memo & E-Mail Etiquettes

(7 Hrs.)

Report -Types, Characteristics, prewriting aspects of report and preparing writing of reports

Memo- Objectives, Types, Structure and Layout

Email-Etiquette, acronyms.

Total Lecture 26 Hours

Textbooks:

1. Meenakshi Raman & Sangeeta Sharma, Technical Communication, Raman & Sharma, Oxford University Press Orford University Press
2. T. Balasubramaniam, Textbook of English Phonetics for Indian Students, Macmillan India Ltd
- 3.

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Nagar Yuwak Shikshan Sanstha's

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SoE No.
23FY-101

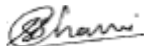
B.Tech First Year

Reference Books:

1.	Dale Carnegie ,How to Develop Self – Confidence & Influence People by Public Speaking
2.	Asha Kaul, Communication Skills
3.	Allen Peas ,Body Language
4.	Gerson's Gerson, Technical Communication

MOOCs Links and additional reading, learning, video material

1.	https://dl.uswr.ac.ir/bitstream/Hannan/141245/1/9781138219120.pdf
2.	https://www.pdfdrive.com/word-power-made-easy-the-complete-handbook-for-building-a-superiorvocabulary-e157841139.html
3.	https://www.pdfdrive.com/improve-your-communication-skills-present-with-confidence-write-with-stylelearn-skills-of-persuasion-e156963640.html
4.	https://www.pdfdrive.com/21-days-of-effective-communication-everyday-habits-and-exercises-to-improveyour-communication-skills-and-social-intelligence-e158273760.html

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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

II SEMESTER

23GE1215 : Indian Knowledge System

Course Outcomes:

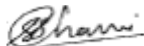
Upon successful completion of the course the students will be able to

1. Apply primary requirements pertaining towards awareness of Indian Knowledge System.
2. Analyze various Indian society, culture and literature to enhance their traditions.
3. Evaluate structure of Indian art.
4. Understand Indian heritage and architectural skills.

Unit:1	Introduction to Indian Civilization	6 Hours
Development of Human Civilization with specific reference: Stone age: Tool Technology and Cultural Development, Indus Valley civilization, Vedic Civilization. (Contemporary Issues related to Topic)		
Unit:2	Indian Society, Culture and Literature	6 Hours
Society and its types, Culture and its Characteristics, Foundational Literature. (Contemporary Issues related to Topic)		
Unit:3	Tradition of Indian Art and Painting	7 Hours
Indian Traditional Painting, Art style folk, mural with Gandhara and Mathura school of art. (Contemporary Issues related to Topic)		
Unit:4	Indic Traditions of Architecture, Design and Planning	7 Hours
Monumental studies of architectural skill: Rock Cut Caves, Stupa and Temple Architecture, The Ancient cities of Indus Saraswati region. Town Planning and drainage system. (Contemporary Issues related to Topic)		
Total Lecture Hours		26 Hours

Textbooks

1	Reader's Digest: Vanished Civilizations, THE READER'S DIGEST ASSOCIATION LIMITED, LONDON, NEWYORK.
2	Qaiser Zoha Alam ; Language and Literature Divers Indian Experience
3	Bal Ram Singh (Author), Nath Girish (Author) ; Science and Technology in Ancient Indian Texts
4	NCERT Books

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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

Reference Books

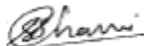
1	B S Harishankar; Art and Archaeology of India: Stone Age to the Present, 2003.
2	Gupte R S and Mahajan B D; Ajanta, Ellora and Aurangabad, 1962.
3	Dharampal, Some Aspects of Earlier Indian Society and Polity and Their Relevance Today, New Quest Publications, Pune, 1987.
4	Michel Lorblanchet, "Rock Art In The Old World" IGNCA series, in India
5	Percy Brown, "Indian Architecture" D. B. Taraporevala sons & co. Pvt. Ltd. Bombay(1959).

PPT's/Research papers

1	https://www.researchgate.net/publication/360889208_STONE_AGE_TOOL_TECHNOLOGY_and_CULTURAL_DEVELOPMENT
2	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=iT1KSV8AAAAJ&sortby=pubdate&citation_for_view=iT1KSV8AAAAJ:UeHWp8X0CEIC

MOOCs Links and additional reading, learning, video material

1	https://prepp.in/news/e-492-indian-architecture-art-and-culture-notes
2	https://www.artzolo.com/blog/most-famous-indian-painting-styles
3	https://www.researchgate.net/publication/360889332_Stone_Age_Tool_Technology_Cultural_Development
4	https://testbook.com/ias-preparation/ancient-history-16-mahajanapadas

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(Department of Civil Engineering)

SoE No.
23CV-101

B.Tech in Civil Engineering

II SEMESTER

23CV1201 : Engineering Mechanics

Course Outcomes :

Upon successful completion of the course the students will be able to

1. Describe the fundamental concepts of statics and dynamics.
2. Apply the basic concepts of applied mechanics for solution of problems on planar force system.
3. Determine the properties of surface like centroid, moment of inertia, etc. for planar surfaces and mass moment of inertia for rigid body.
4. Analyze pin jointed truss frame structure and beam structure analytically and graphically.
5. Evaluate the dynamic variables of kinetics of particles and simple lifting machine

Unit I: Resultant of planar force System

(7 Hrs.)

Fundamental concepts, system of forces, laws of mechanics, principle of transmissibility of force, Moment of force, Principle of moment, Couple, Resultant of a planar force system, Equivalent force couple system. **(Contemporary Issues related to Topic)**

Unit II: Equilibrium of planar force System

(6 Hrs.)

Free body diagrams, Conditions of equilibrium, types of supports, types of beams, types of loads on beam, Equilibrium of a planar force system **(Contemporary Issues related to Topic)**

Unit III: Friction and Trusses

(7 Hrs.)

Friction: Coulomb's laws of dry friction, plane friction, belt friction.
Trusses: Types of trusses, assumptions in analysis of truss, Analysis of truss by method of joint. **(Contemporary Issues related to Topic)**

Unit IV: Properties of Surfaces

(6 Hrs.)

Centroid: Introduction, First Moment of Area, Centroid of composite areas.
Moment of Inertia: Introduction, Second Moment of Area, Polar moment of Inertia, Radius of Gyration, Transfer formula for moment of Inertia, Product of Inertia, Moment of Inertia, and product of inertia for composite areas, Principal Moments of Inertia. **(Contemporary Issues related to Topic)**

Unit V: Virtual Work Method and Kinetics of Particle

(7 Hrs.)

Virtual Work Method: Introduction, Principle of virtual work, Application to beam and frame.
Kinetics of Particle: Introduction, Newton's law of motion for a Particle, D'Alembert's principle, Translation of particle and connected system. **(Contemporary Issues related to Topic)**

Unit VI: Work Energy and Impulse Momentum Method

(6 Hrs.)

Work Energy Method: Introduction, Work energy equation for translation, Work energy applied to particle motion and connected system.
Impulse Momentum Method: Introduction, Linear Impulse momentum, Conservation of linear momentum, coefficient of restitution, elastic impact, Impulse momentum in plane motion. **(Contemporary Issues related to Topic)**

Total Lecture 39 Hours

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23CV-101**

B.Tech in Civil Engineering

Textbooks:

1. Nelson A., Engineering Mechanics (Statics and Dynamics), ed 2009, Tata Mc. Graw Hill Education Pvt. Ltd., New Delhi, 2009.
2. Dubey N.H., Engineering Mechanics (Statics and Dynamics) first edition 2013, Tata Mc. Graw Hill Education Pvt. Ltd., New Delhi, 2013.
3. Singer F.L., Engineering Mechanics (Statics and Dynamics), Harper and Rowe publication, New Delhi, 1994.

Reference Books:

1. Timoshenko S, Young D.H and Rao J.V, Engineering Mechanics, Mc. Graw Hill Publication, New Delhi, 2007.
2. Bhattacharyya B., Engineering Mechanics, Oxford University Press, New Delhi, 2008.
3. Hibbeler R.C, Engineering Mechanics (Statics and Dynamics), Pearson Publication, Singapore, 2000.
4. Shames I.H. and Rao J.V., Engineering Mechanics (Statics and Dynamics), First Edition, Pearson Publication, New Delhi, 2003.
5. Beer F.P. and Johnston E.R; Vector Mechanics for Engineers, 9th edition Tata Mc. Graw Hill Publication, New Delhi. 2007.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/78.%20Engineering-Mechanics-Statics-and-Dinamics-E-W-Nelson-C-L-Best-W-G-McLean-1st-Ed-1997-Schaum-Outline-McGraw-Hill%20(1).pdf
- 2 chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/79.%20Engineering%20Mechanics.%20Statics-%20MERIAM%20%20AND%20KRAIGE.pdf
- 3 chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/81.%20Engineering%20Mechanics%201.pdf

MOOCs Links and additional reading, learning, video material

1. <https://www.youtube.com/watch?v=nGfVTNfNwnk>
2. <https://www.youtube.com/watch?v=6nguX-cEsvw>
3. <https://nptel.ac.in/courses/112103108>

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B.Tech in Civil Engineering

II SEMESTER

23CV1202 : Lab. Engineering Mechanics

Course Outcomes

Upon successful completion of the course the students will be able to

1. Describe the fundamental concepts of statics and dynamics.
2. Apply the basic concepts of applied mechanics for solution of problems on planar force system.
3. Determine the properties of surface like centroid, moment of inertia, etc. for planar surfaces and mass moment of inertia for rigid body.
4. Analyze pin jointed truss frame structure and beam structure analytically and graphically.
5. Evaluate the dynamic variables of kinetics of particles and simple lifting machine

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	To find determine the support reactions of a Simply Supported Beam experimentally and analytically.
2	To determine the forces in the members of a Jib Crane Apparatus experimentally and graphically.
3	To determine the coefficient of friction between two surfaces of different material on Plane Friction Apparatus.
4	To determine the coefficient of friction of Coil Friction Apparatus.
5	To determine the forces in members of a Shear Leg Apparatus experimentally and manually.
6	To determine the mass moment of inertia of a fly wheel using Fly Wheel Apparatus
7	To determine efficiency and law of machine of Differential Axel & Wheel machine.
8	To determine efficiency and Law of machine of Single Purchase Crab machine.
9	To determine efficiency and Law of machine of Double Purchase Crab machine.
10	To verify law of polygonal of forces using Law of Polygon Apparatus.
11	To find support reactions of a simply supported beam using graphical method and hand calculation.
12.	To find the forces in the member of truss using graphical method and hand calculation.
13.	To find (1) Principle moment of inertia and (2) Moment of inertia and product of inertia about any inclined axis for a composite figure using Mohr's circle and hand calculation,

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B.Tech in Information Technology

SoE No.
23IT-101

II SEMESTER

23IT1203 : Programming for Problem Solving

Course Outcomes :

- 1) Understand the basics of computer system operations and algorithms, flowcharts.
- 2) Apply the basics of C programming for problem solving.
- 3) Apply and analyze the different dimensional arrays for problem solving.
- 4) Understand the basics of string, structure, and union and apply them to problem solving.

Unit I: Computer System Basics:

(3 Hrs.)

Basics of programming and problem solving. Introduction to algorithms and flowcharts, Types of programming errors, basic input/output statements and functions (scanf, printf, getch, putch, gets, puts), Introduction to library functions,

Unit II: Basic of C Programming

(6 Hrs.)

Basic building blocks of C: Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, , bitwise operators, precedence of operators, Expressions, sizeof() operator, constants, typedef statement, writing straight line programs. Decision control statements: if, if - else and nested if-else statements, else-if ladder statement, switch-case control statement.

Unit III: Loop Structures:

(5 Hrs.)

While, do while and for loops, break and continue statement, “goto” statement, real life programming examples based on these loop structures, real life programming examples.

Unit IV: Modular Programming:

(6 Hrs.)

Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value , call by reference, C programs using functions, Recursive functions, comparing recursion against iteration, C programs using recursive functions, real life programming examples

Unit V: Arrays:

(6 Hrs.)

One dimensional array, array manipulation, insertion, deletion of an element, searching techniques- Linear and binary search, sorting technique – Bubble sort. Two-dimensional arrays: matrix representation, programs for basic matrix operations such as addition, multiplication and transpose, Array as function arguments. real life programming examples

Unit VI: String, Structure and Union:

(4 Hrs.)

Strings: string representation and string handling functions, Introduction to pointer, structure and union. real life programming examples

Total Lecture 30 Hours

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Text books

1	The C Programming Language, J.B.W.Kernighan & D.M.Ritchie, Prentice Hall
2	Mastering C, K.R.Venugopal & S.R. Prasad, TMH, 2007.
3	Programming in ANSI C, E. Balaguruswamy, Mc Graw Hill Education

Reference Books

1	Problem Solving And Program Design In C, Jeri. R. Hanly, Elliot B. Koffman, Pearson Education.
2	Programming with C, Byron Gottfried, Schaum;s Outline Series
3	How to solve it by computers, R. G. Dromey, Prentice Hall India

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MOOCs Links and additional reading, learning, video material

1	https://nptel.ac.in/courses/106104128
2	https://nptel.ac.in/courses/106104128
3	https://www.youtube.com/watch?v=rQoqCP7LX60&list=PLxgZQoSe9cg1drBnejUaDD9GEJBGQ5hMt

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**SoE No.
23IT-101**

II SEMESTER

23IT1204 : Lab. Programming for Problem Solving

Course Outcomes: Students will be able to

- 1) Understand the basics of computer system operations and algorithms, flowcharts.
- 2) Apply the basics of C programming for problem solving.
- 3) Apply and analyze the different dimensional arrays for problem solving.
- 4) Understand the basics of string, structure, and union and apply them to problem solving.

Unit I: Computer System Basics:	(3 Hrs.)
Basics of programming and problem solving. Introduction to algorithms and flowcharts, Types of programming errors, basic input/output statements and functions (scanf, printf, getch, putch, gets, puts), Introduction to library functions,	
Unit II: Basic of C Programming	(6 Hrs.)
Basic building blocks of C: Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, , bitwise operators, precedence of operators, Expressions, sizeof() operator, constants, typedef statement, writing straight line programs. Decision control statements: if, if - else and nested if-else statements, else-if ladder statement, switch-case control statement.	
Unit III: Loop Structures:	(5 Hrs.)
While, do while and for loops, break and continue statement, “goto” statement, real life programming examples based on these loop structures, real life programming examples.	
Unit IV: Modular Programming:	(6 Hrs.)
Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value , call by reference, C programs using functions, Recursive functions, comparing recursion against iteration, C programs using recursive functions, real life programming examples	
Unit V: Arrays:	(6 Hrs.)
One dimensional array, array manipulation, insertion, deletion of an element, searching techniques- Linear and binary search, sorting technique – Bubble sort. Two-dimensional arrays: matrix representation, programs for basic matrix operations such as addition, multiplication and transpose, Array as function arguments. real life programming examples	
Unit VI: String, Structure and Union:	(4 Hrs.)
Strings: string representation and string handling functions, Introduction to pointer, structure and union. real life programming examples	
Total Lecture	30 Hours

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23IT-101

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2	Mastering C, K.R.Venugopal & S.R. Prasad, TMH, 2007.
3	Programming in ANSI C, E. Balaguruswamy, Mc Graw Hill Education

Reference Books

1	Problem Solving And Program Design In C, Jeri. R. Hanly, Elliot B. Koffman, Pearson Education.
2	Programming with C, Byron Gottfried, Schaum's Outline Series
3	How to solve it by computers, R. G. Dromey, Prentice Hall India

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MOOCs Links and additional reading, learning, video material

1	https://nptel.ac.in/courses/106104128
2	https://nptel.ac.in/courses/106104128
3	https://www.youtube.com/watch?v=rQoqCP7LX60&list=PLxgZQoSe9cg1drBnejUaDD9GEJBGQ5hMt

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List of Practical

SN	Unit	Name Of The Practical	Remark	CO'S Mapped	PO'S Mapped
1(A)		Introduction to Linux Operating system & it's different commands.	Manual	CO 1	PO1
1(B)		Introduction to Vi editor, Compilation and Execution of a program in Linux.	Manual	CO 1	PO1
2	II	Practical based on Arithmetic and Conditional operators.	Operators	CO 1	PO1
3	II	Practical based on Conditional and Unconditional Statements.	Conditional Statements	CO 1	PO1
4	III	Practical based on Entry Controlled Looping Statements.	For / While Loop	CO 2	PO 1, PO 2
5	III	Practical based on Exit Controlled Looping Statement	Do while Loop	CO 2	PO 1, PO 2
6	IV	Practical based on Functions and Recursion.	Functions / Recursion	CO 3	PO2, PO3
7	V	Practical based on 1-D Array.	1D Array	CO 3	PO2, PO3
8	V	Practical based on 2-D Array.	2D Array	CO 3	PO2, PO3
9	VI	Practical based on Strings.	Strings & Pointers	CO 3	PO2, PO3
10	VI	Practical based on Structures.	Structures	CO 4	PO1, PO2, PO3

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B.Tech First Year

II SEMESTER

23GE1218 : Functional English

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Understand the concept of FE (Functional English) and its application in various real-life scenarios.
2. Develop basic interactive communication skills, including greetings, asking for information, stating opinions, and providing feedback.
3. Acquire knowledge of social networking, texting, instant messaging, blogs, and discussion boards, along with the ethical considerations associated with online communication.
4. Successfully complete quizzes and assignments assessing knowledge in the covered topics of FE, social media, tenses, and effective communication.

Unit:1	Introduction to Functional English	6 Hours
What is FE? And Areas of application. Basic Interactive sentences - Greetings & Replies, Asking for information, Telling people what you do, Asking somebody's opinion, Giving your opinion, Saying someone is correct, Saying that someone is wrong, Apologizing, Praising someone's work, Saying goodbye. Introduction & Basics of Common Expressions – Offer, Request, Gratitude, Apology. Modal Verbs - Words used often: Can- could, Will – would, Shall – should, Ought to-Must, May-might. Practice exercises, Practice Conversations, Script Activity		
Unit:2	Internet & Social Media Communication	6 Hours
Introduction & Basics to Social Networking, Texting & Instant messaging, Blogs & Discussion Board- discussion with examples, Ethics of social media & communication Topic: Introduction to Creative Ads Why Ads, What's in it for me? Characteristics of ads. Assignment Quiz on the above Topics, Exercises for Evaluation		
Unit:3	TENSES	6 Hours
Introduction & Basics, Simple Tense (Past, Present, Future), Continuous Tense (Past, Present, Future) – discussion with examples. Introduction & Basics, Perfect Tense (Past, Present, Future), Perfect Continuous Tense (Past, Present, Future) – discussion with examples Introduction to Movie Magic, Learn English with films, Film Vocabulary, Describing a film, Types of Films Assessment – Letter and Email Writing, Tenses – Quiz		
Unit:4	Written Communication	5 Hours
Introduction & Basics of Writing, five methods of communication, Mind your grammar, Commonly confusing words Letters – Format, Parts of a business letter, When does communication fail?, Things to remember, Positive language not negative language, Active voice not passive voice Effective emailing -How to make an effective e-mail, Few common e-mail habits that cause problems, Parts of an e-mail, Some other important aspects.		

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B.Tech First Year

Assignment Presentation on Mad Ads, Quiz on Tenses and social media-Internet Communication
Topic: Activity Extempore

EVALUATION			1 Hour
WRITTEN TEST	TA=60	ESE=40	TOTAL=100
Total Lecture Hours			24 Hours

Reference Books

- 1 How to win friends & influence people – Dale Carnegie
2. Functional English for Communication - Ujjwala Kakarla
- 3 Functional English for Technical Students – Dr Prathibha Mahato & Dr Dora Thompson

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SoE No.
23CV-101

I & II SEMESTER

Audit Course

GE2301 : Disaster Management and Preparedness

Course Outcomes :

Upon successful completion of the course, the students will be able to

CO1: Explain the basic concepts, classifications and causes of disasters.

CO2: Identify the impacts of disasters on society, environment and economy.

CO3: Describe disaster risk reduction measures and disaster management practices.

CO4: Explain sustainable recovery methods and accessibility measures during disasters.

Unit:1 Introduction to Disasters 7 Hours

Definition and Classification: Natural and Man-made disasters; Concepts: Hazard, vulnerability, risk, resilience, capacity building; Disaster Cycle: Preparedness, response, recovery, mitigation; Brief about Global and Indian perspectives: Case studies

Unit:2 Common Disasters and Their Safety Measures 6 Hours

Natural Disasters : Earthquakes, Landslides, Tsunamis, Floods, Glacial lake outburst floods (GLOFs) ; Volcanic Eruptions Types, monitoring, volcanic hazards ; Cloud burst, Cyclones & Storm Surges, Classification, impacts, prediction ; Forest Fires: Causes, spread, control measures; Desertification and Droughts: Types, causes, and management; Anthropogenic Disasters: Industrial & Chemical Accidents; Nuclear Hazards , safety measures; Urban Disasters: Building collapses, fires ; Environmental Pollution: Air, water, soil contamination incidents

Unit:3 Disaster Impacts and Disaster Preparedness 7 Hours

Disaster impacts: (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Emergency preparedness: Evacuation, emergency kits, and communication; Early warning systems and basic use of GIS in disaster management; relief and rehabilitation: Temporary shelters and community support.

Unit:4 Disaster Management & Policies, Institutions, and Governance 6 Hours

Disaster Management Act, 2005 and amendments – Overview, National and State Disaster Management Authorities (NDMA & SDMA), Disaster Risk Reduction (DRR) and the Sendai Framework, Role of Government, NGOs, and Community in disaster management, Responsibilities of citizens and engineers during disasters.

Total Lecture 26 Hours

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23CV-101

Text books

1	Anil K. Gupta, Pradeep K. Goyal(2026). Disaster Management, Khanna Publishing House
2	R Subramanian(2023). Disaster Management . Vikas Publication
3	Coppola, D.P. (2015). Introduction to International Disaster Management. Elsevier.
4	Shaw, R., & Krishnamurthy, R. (2009). Disaster Management: Global Challenges and Local Solutions. Universities Press.
5	Alexander, D. (2002). Principles of Emergency Planning and Management. Oxford University Press.

Reference Books

1	NDMA (2005 & updates). Disaster Management Guidelines. Government of India
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1	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec24_hs83
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MOOCs Links and additional reading, learning, video material

1	https://www.youtube.com/watch?v=-dxhci6s9tY
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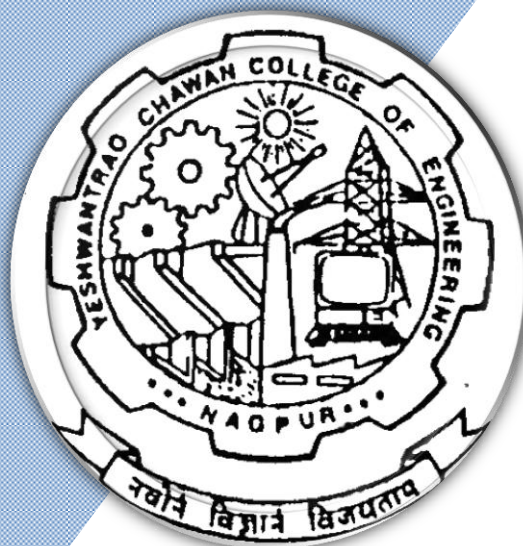
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(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

3rd Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
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B.TECH SCHEME OF EXAMINATION 2023
 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
 B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	BS	GE	23GE1302	Integral Transform	T	3	0	0	3	3	30	20	50	3
2	3	HSSM-1	GE	23GE1301	Fundamentals of Management & Economics	T	2	0	0	2	2	30	20	50	3
3	3	VEC-1	CV	23CV1311	Environmental Sustainability, Pollution and Management	T	2	0	0	2	2	30	20	50	3
4	3	PC	EL	23EL1301	Electrical Energy Generation System	T	3	0	0	3	3	30	20	50	3
5	3	PC	EL	23EL1302	Lab: Renewable Energy Sources	P	0	0	2	2	1		60	40	
6	3	PC	EL	23EL1303	Network Analysis	T	3	0	0	3	3	30	20	50	3
7	3	PC	EL	23EL1304	Lab : Electrical Engineering Workshop	P	0	0	2	2	1		60	40	
8	3	PC	EL	23EL1305	Electrical Machines	T	3	0	0	3	3	30	20	50	3
9	3	PC	EL	23EL1306	Lab : Electrical Machines	P	0	0	2	2	1		60	40	
10	3	CEP	EL	23EL1307	Community Engagement Project	P	0	0	2	4	2		60	40	
11	3	OE-I	OE		Open Elective -I	T	2	0	0	2	2	30	20	50	3
12	3	MDM	MDM		MD Minor Course-I	T	2	0	0	2	2	30	20	50	3
TOTAL							20	0	8	30	25				

List of Mandatory Learning Course (MLC)

1	3	HS	T&P	MLC2123	YCAP3 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Open Elective - I

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject
1	3	OE1	GE	23OE1301	OE-I : Combinatorics
2	3	OE1	GE	23OE1302	OE-I : Fuzzy Set Theory, Arithmetic And Logic
3	3	OE1	GE	23OE1303	OE-I : Green Chemistry & Sustainability
4	3	OE1	GE	23OE1304	OE-I : Hydrogen Fuel
5	3	OE1	GE	23OE1305	OE-I : Electronic Materials And Applications
6	3	OE1	GE	23OE1306	OE-I : Laser Technology And Applications
7	3	OE1	MGT	23OE1307	OE-I : Finance And Cost Management
8	3	OE1	MGT	23OE1308	OE-I : Operation Research Techniques
9	3	OE1	MGT	23OE1309	OE-I : Project Evaluation & Management
10	3	OE1	MGT	23OE1310	OE-I : Total Quality Management
11	3	OE1	MGT	23OE1311	OE-I : Value Engineering
12	3	OE1	MGT	23OE1312	OE-I : Maintenance Management
13	3	OE1	MGT	23OE1313	OE-I : Industrial Safety
14	3	OE1	MGT	23OE1314	OE-I : Industry 4.0
15	3	OE1	MGT	23OE1315	OE-I : Operation Management
16	3	OE1	MGT	23OE1316	OE-I : Material Management
17	3	OE1	MGT	23OE1317	OE-I : Hospitality Management
18	3	OE1	MGT	23OE1318	OE-I : Human Resource Management & Organizational Behaviour
19	3	OE1	MGT	23OE1319	OE-I : Agri-Business Management
20	3	OE1	MGT	23OE1320	OE-I : Rural Marketing
21	3	OE1	MGT	23OE1321	OE-I : Marketing Management
22	3	OE1	MGT	23OE1322	OE-I : Health Care Management
23	3	OE1	MGT	23OE1323	OE-I : Designated approved online NPTEL/KKSU Course
24	3	OE1	MGT	23OE1324	OE-I : Indian Archeology
25	3	OE1	MGT	23OE1325	OE-I : Social & Positive Psychology
26	3	OE1	MGT	23OE1326	OE-I : Seismology & Earthquake

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III /IV SEMESTER

23GE1302/23GE1402 : Integral Transforms

Course Outcomes:

Upon successful completion of the course the students will be able to

- 1 Apply the knowledge of Laplace and Fourier transforms to solve the continuous problems.
2. Apply the knowledge of Z transforms to solve the discrete mathematical equations.
3. Determine Fourier series expansion of periodic functions, Fourier Transform.
4. Use appropriate methods to solve partial differential equations.

Unit I:

7 Hrs.

Laplace Transforms : Definition and examples of Laplace transforms, properties of Laplace transforms, Examples by using properties of Laplace transforms, Unit step function, periodic function.

Unit II:

8 Hrs.

Inverse of Laplace Transform: Definition and examples of Inverse Laplace transforms, Inverse Laplace transform by using properties, Partial fraction method to find Inverse Laplace transforms, convolution theorem, Applications of Laplace transform to solve ordinary differential equations.

Unit III:

7 Hrs.

Z-Transform: Some elementary concepts, Definition of Z-Transform, Examples of Z-Transform, Properties (without proof), Inversion by partial fraction decomposition and residue theorem, Applications of Z-transform to solve difference equations with constant co-efficient.

Unit IV:

8 Hrs.

Fourier Series: Periodic Functions, standard results, Fourier series expansion, Convergence of Fourier Series, Fourier Series for even and odd function, Change of interval, half range Fourier Series, Examples on half range sine and cosine series.

Unit V:

8 Hrs.

Fourier Integral: Fourier Integral of a function formula and examples, Fourier Cosine integral, Fourier Sine integral, Complex Fourier integral, Evaluation of integration using Fourier integral.

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Unit VI:	7 Hrs.
Fourier Transforms: Fourier Transform, Fourier sine and cosine transformation and its examples, Properties of Fourier sine and cosine transform and its examples, Application of Fourier sine and cosine transform on Partial differential equation, Parseval's Identity.	
Total Lecture	45 Hours

Textbooks:	
1	Erwin Kreyzig, Advance Engineering Mathematics, 9 th Edition, John Wiley and Sons, INC.
2	Dr. B. S. Grewal, Higher Engineering Mathematics, 40 th edition, Khanna Publisher.
3	H.K. Dass, Advanced Engineering Mathematics, 8 th revised edition, S. Chand, Delhi.

Reference Books:	
1	Chandrika Prasad, Mathematics for Engineers, 19 th Edition, John Wiley and Sons, INC.
2	L. A. Pipes and Harville, Applied Mathematics for Engineers, 3 rd Edition, McGraw Hill.
3	P.N. and J. N. Wartikar, A text book of Applied Mathematics, 3 rd edition, Pune Vidyarthi Griha Prakashan
4	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 10 th edition, Laxmi Prakashan.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Suprted%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Mathematics%20and%20Humanities/

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/111106111
2	https://onlinecourses.nptel.ac.in/noc22_ma41/preview
3	https://archive.nptel.ac.in/courses/111/101/111101153/

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23EL-101

III SEMESTER

23GE1301: Fundamentals of Management & Economics

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Develop the Managerial Perspective and perform the various functions of management for optimum utilization of Engineering Resources
2. Identify and Analyze the role of Financial Accountancy and Marketing Management in the Organization
3. Develop perspective about economy based on logical reasoning and estimate the economic outcomes.
4. Interprets comparative advantage of resources.

Unit I:

7 Hrs.

Principles of Management: Evolution of Management Thought: Scientific and Administrative Theory of Management, Definition and Concept of Management, Functions of Management: Planning, Organizing, Directing, Staffing and Controlling, Motivational Theories, Concept of Leadership.

Unit II:

8 Hrs.

Marketing and Financial Management: Marketing and Financial Management –Marketing Theories and Concept-Marketing Mix, Market Segmentation, Targeting and Positioning and Functions Financial Management and Accountancy- Accountancy Rules and Capital, Preparation of Books of Account- Journal posting of Transaction into ledger and preparation of trial Balance, Introduction of Trading Account, Profit and loss account and balance sheet.

Unit III:

7 Hrs.

Introduction to Microeconomics: Nature and Scope of Microeconomics, Demand Analysis: Meaning and determinants of demand, law of demand, Elasticity of Demand - types and degrees, Utility analysis, Law of diminishing marginal utility, supply- law of supply, Law of Variable proportions and Return to Scale, Classification of market structure.

Unit IV:

8 Hrs.

Introduction to Macroeconomics: Nature and Scope of Macroeconomics, Concept of GDP, GNP, NDP, NNP, Measurement of GDP; Economic Growth and development, Money – definition, types and function of money, Inflation – meaning, types, causes and measure to control, concept of deflation, functions of central and commercial bank, Sources of public revenue - direct and indirect taxes.

Total Lecture

30 Hours

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Textbooks:

1	Principle of Management, 9 th edition, Harold Koontz Ramchandra, Tata McGraw hills
2	Marketing Management: Planning, Implementation and Control, 3 rd Edition, Ramaswamy V.S. and Namakumari S, Macmillian
3	Fundamentals of Accounting Gupta R.L. & Radhaswamy ;
4	Modern Economics, 13 th Edition, H. L. Ahuja, S. Chand Publisher, 2009
5	Modern Economic Theory, 3 rd edition, K. K. Devett, S. Chand Publisher, 2007
6	Principle of Economics, 7 th edition, Mankiw N. Gregory, Thomson, 2013

Reference Books:

1	Foundations of Financial Markets and Institutions, 3 rd Edition, Fabozzi, Prentice Hall
2	Fundamentals of Financial Instruments, 2 nd Edition, Parameshwaran, Wiley India
3	Marketing Management, 3 rd Edition, Rajan Saxena, Tata McGraw Hill
4	Advance Economic Theory, 17 th Edition, H. L. Ahuja, S. Chand Publisher, 2009
5	International Trade, 12 th edition, M. L. Zingan, Vindra Publication, 2007
6	Macro Economics, 11 th edition, M. L. Zingan, Vindra Publication, 2007
7	Monitory Economics, 1 st Edition, M. L. Sheth, Himalaya Publisher, 1995

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material

1	https://onlinecourses.nptel.ac.in/noc22_mg104/preview
2	https://archive.nptel.ac.in/courses/110/101/110101131/
3	https://onlinecourses.nptel.ac.in/noc23_mg122/preview
4	https://onlinecourses.nptel.ac.in/noc21_hs52/preview
5	https://onlinecourses.nptel.ac.in/noc22_hs67/preview

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SoE No.
23EL-101

III/IV SEMESTER

23CV1311/23CV1411

Environmental Sustainability, Pollution and Management

Course Outcomes :

Upon successful completion of the course, the students will be able to

The student will be able to

1. Gain insights into the efforts to safeguard the Earth's environment and resources.
2. Develop a critical understanding of the contemporary environmental issues of concern
3. Have an overview of pollution, climate change and national and global efforts to address adaptation and mitigation to changing environment through environmental management.
4. Learn about the major international treaties and our country's stand on and responses to the major international agreements.

Unit:1	Environment and Sustainable Development	8 Hours
The man-environment interaction; Overview of natural resources: renewable, and non-renewable energy resources; Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs; Environmental issues: Global change, Climate Change and Mitigation.		
Unit:2	Environmental Pollution and Health	7 Hours
Understanding pollution: Production processes and generation of wastes, Air pollution, Water pollution, Soil pollution and solid waste, Noise pollution, Thermal and Radioactive pollution. Impact on biotic and abiotic things.		
Unit:3	Environmental Management	8 Hours
Environmental management system: ISO 14001, Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis, Environmental audit and impact assessment; Waste Management and sustainability; Ecolabeling /Eco mark scheme		
Unit:4	Environmental Treaties and Legislation	7 Hours
Introduction to environmental laws and regulation, An overview of instruments of international cooperation, Major International Environmental Agreements, Major Indian Environmental Legislations, Major International organizations, and initiatives		
Total Lecture		30 Hours

Text books

1	Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future. 10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson
2	Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press
3	Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK
4	Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment and Human Impact. Pearson Education
5	Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge.
6	Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press
7	Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press

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Reference Books

1	Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, Oxford University Press
2	Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science, Ela Publisher (Pearson)
3	William P. Cunningham and Mary A. (2015). Cunningham Environmental Science: A global concern, Publisher (Mc-Graw Hill, USA)
4	Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022) Conservation through Sustainable Use: Lessons from India. Routledge.
5	Central Pollution Control Board Web page for various pollution standards. https://cpcb.nic.in/standards
6	Barnett, J. & S. O'Neill (2010). Maladaptation. Global Environmental Change—Human and Policy Dimensions 20: 211–213
7	Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press
8	Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf

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1

MOOCs Links and additional reading, learning, video material

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III SEMESTER

23EL1301 : Electrical Energy Generation System

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Classify types of renewable energy sources and different factors associated with a generating station
2. Explain various parameters related to selection and application of Solar, Wind Energy and Biogas
3. Illustrate design parameters for Hydro and Thermal Power generating Systems.
4. Explain various parameters related to generation of Nuclear Power

Unit:1	Introduction to generation systems	7 Hours
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Importance of Electrical Energy, Generation of Electrical Energy, Relationships among Energy units, Calorific value of fuels.

Sources of Electrical energy- Coal, oil and natural gas, hydro, solar, wind and nuclear energy. Different factors associated with a generating station : connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity and utilization factor, load curve and load duration curve load survey, base load and peak load station, advantages of interconnection.

Tariff:- Definition, Objective, Characteristics of tariff, Types of Tariff (Numerical), economical choice of tariff.

Contemporary Issues related to Topic

Unit:2	Solar Energy	8 Hours
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Solar radiation & its Measurement: - Solar constant, Solar radiation at earth's surface, Solar radiation geometry, Solar radiation on tilted surfaces, Solar radiation measurement, Solar Energy Collectors: - Physical principles of the conversion of solar radiation into heat, flat plate collectors. Applications of Solar energy: Solar Dryer, Solar Still, Solar cooker

Solar Photovoltaic Cell: Principle of solar photovoltaic energy conversion, Equivalent circuit of solar cell

Contemporary Issues related to Topic

Unit:3	Wind Energy	7 Hours
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Principle of wind energy conversion, Power in the wind, Cut In, Cut Off Wind Speed, Site selection considerations, Basic components of wind energy conversion systems (WECS), Classification of WEC systems, Advantages and Limitations of WECS, Types of wind Machines (HAWT and VAWT), Application of wind energy.

Contemporary Issues related to Topic

Unit:4	Hydro Power Station	8 Hours
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Schematic arrangement of Hydroelectric Power Station, Constituents of Hydroelectric power plant, Advantages and Limitations of Hydro-electric Plants, Hydrology, stream flow, flow duration curve, power duration curve, mass curve, reservoir capacity, Water Power equation (Numerical), type of hydro power plants and their field of use, pumped storage plant and their utility, surge tanks. General study of Hydro Turbine, Introduction to Small hydro plants.

Contemporary Issues related to Topic

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Unit:5	Thermal Power Station	7 Hours
Introduction, Site selection, size and number of units, general layout, major equipment, auxiliaries, electric supply to auxiliary, cost of generation, effect of different factors on costs. General study of steam Turbine. Condenser: Different types of condensers. Construction and Working principle of Condenser Contemporary Issues related to Topic		
Unit :6	Nuclear Power Plant and Biomass Energy	8 Hours
Site selection for nuclear power plant, introduction to nuclear physics, chain reaction, Working Principle of nuclear Power Plant, Components of a nuclear reactor, types of nuclear reactor, material for moderator and control rods, control of nuclear reactors, , economics of nuclear power generation. Biogas production from waste biomass, classification of biogas plants, operational parameters, availability of raw material and gas yield. Contemporary Issues related to Topic		
		Total: 45 Hours

Text books

1	M.L.Soni,P.V.Gupta,U.S.Bhatnagar,A Textbook on Power System Engineering, 2nd edition 2014, Dhanpat Rai and Co.
2	V.K.Mehta, Rohit Mehta, Principles of Power System, 2nd edition 2008,S.Chand
3	B.R.Gupta,Generation of Electrical Energy,5th edition 2007 ,S.Chand
4	G. D. Rai,Non-Conventional Energy Sources, 5th edition 2011, Khanna Publication

Reference Books

1	T.K. Nagsarkar, M.S. Sukhija,Power System Analysis,1st edition 2007, Oxford Publication
2	Ashfaq Hussain,Electrical Power System,5th edition 2007, CBS Publication

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20System%20Engineering/Principles%20of%20Power%20Systems%20V.K%20Mehta.pdf
2	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Renewable%20Energy%20Sources/B.H.Khan%20Book%20RES.pdf
3	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Renewable%20Energy%20Sources/Solar%20Energy%20pdf.pdf

MOOCs Links and additional reading, learning, video material

1	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems [Intro Video]
2	http://103.152.199.179/YCCE/DTEL%20Material/3.Electrical%20Engineering/DTEL%20PPTs/IV%20SEMESTER/EL-2253%20EEGS/

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III SEMESTER

23EL1302: Lab. Renewable Energy Sources

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Summarize, classify types of renewable energy sources, outline as per Global and Indian context
2. Utilize ,analyze solar energy for various applications.
3. Classify, analyze wind energy conversion systems and estimate its parameters.

Minimum Eight Practical's to be performed from the list as below

S. N.	Experiments based on
1	To analyze I-V and P-V characteristics of single PV module
2	To analyze I-V and P-V characteristics of series connected PV modules
3	To analyze I-V and P-V characteristics of parallel connected PV modules
4	To observe effect of shading on power output of single PV module
5	To observe effect of tilt angle on power output of single PV module
6	To explain working of Solar Water Heater in natural convection and force convection mode
7	To explain the Biogas generation plant model set up at YCCE College
8	To explain working of Solar Cooker A)Box type B)Concentrated type
9	To design home Solar PV system
10	To explain Hydroelectric Power plant

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III SEMESTER

23EL1303 : Network Analysis

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- 1) Apply node voltage and mesh current analysis methods to electric circuits.
- 2) Apply network theorems to electric circuits.
- 3) Determine initial and final values of current and voltage of electric circuits containing energy storage elements.
- 4) Apply Laplace transform to electric circuits.

Unit:1	Nodal Analysis of Electric Circuits	7 Hours
Basics of electric circuits, circuit elements and their voltage – current relationship, classification of circuit elements, sources - their types and characteristics, concept of equivalent sources, source transformation, concept of supernode and V – shift, nodal analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy.		
Contemporary Issues related to Topic		
Unit:2	Mesh Analysis of Electric Circuits	8 Hours
Concept of supermesh and I – shift, mutual inductance, coefficient of coupling, dot convention, dot marking in coupled coils, mesh analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy.		
Contemporary Issues related to Topic		
Unit:3	Network Theorem	7 Hours
Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem.		
Contemporary Issues related to Topic		
Unit:4	Initial and Final Conditions, Impedance Functions And Circuit Analysis With Laplace Transform.	8 Hours
Concept of initial and final conditions, behavior of resistor, inductor and capacitor at $t = 0^-$ and at $t = 0^+$, procedure for evaluating initial and final conditions, analytical treatment. Review of Laplace Transform, concept of complex frequency, transform impedance and admittance, s – domain impedance and admittance models for resistor, inductor and capacitor, series and parallel combinations of elements. Transformed network on loop and mesh basis, mesh and node equations for transformed networks, time response of electrical network with and without initial conditions by Laplace transform. Contemporary Issues related to Topic		
Unit:5	Transforms of other Signal Waveforms, Network Functions, Poles and Zeros Of Network Functions	7 Hours
Unit step, ramp and impulse functions with and without time delay, their Laplace transform, waveform synthesis and its application to electrical networks. Terminal pairs or ports, network functions for one port and two port networks, definition and physical interpretation of poles and zeros, pole-zero plot for network functions, restrictions on pole and zero locations for driving point and transfer functions, time domain behavior from the pole – zero plot, network synthesis using pole – zero plot.		

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23EL-101

Unit :6	Two Port Parameters	8 Hours
Standard reference directions for the voltages and currents of a two – port network, defining equations for open circuit impedance, short circuit admittance, transmission, inverse transmission, hybrid and inverse hybrid parameters, relationships between parameter sets, conditions for reciprocity and electrical symmetry in terms of two – port parameters, interconnections of two - port networks.		
Contemporary Issues related to Topic		
Total Lecture Hours		45 Hours

Text books	
1	M. E. Van Valkenburg , “Network Analysis” , PHI Learning Private Limited , Third Edition.
2	William H. Hayt, Jack E. Kemmerly, Steven M. Durbin , “Engineering Circuit Analysis” , McGraw – Hill , Eighth Edition.
3	Decarlo , Lin , “Linear Circuit Analysis” , Oxford Univ. Press , Second Edition

Reference Books	
1	Syed A. Nasar , “Schaum’s 3000 Solved Problems In Electric Circuits Book 1 & 2” , McGraw - Hill , First Edition.
2	Joseph A. Edminister , “Schaum’s Outline Series : Theory and Problems of Electric Circuits” , McGraw - Hill , Fifth Edition.
3	Lawrence P. Huelsman , “Basic Circuit Theory” , PHI Learning Private Limited , Third Edition.
4	Ravish R. Singh , “Network Analysis And Synthesis” , McGraw - Hill Education (India) Private Limited.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-90-481-9442-1
2	https://web.p.ebscohost.com/ehost/detail/detail?vid=2&sid=4051e547-e3c2-4c21-8a54-384a6b804d38%40redis&bdata=JnNpdGU9ZWVhc3QtbGl2ZQ%3d%3d#AN=2196243&db=e230xww
3	http://link.springer.com/openurl?genre=book&isbn=978-0-412-38310-6

MOOCs Links and additional reading, learning, video material	
1	Course on Circuit Theory By Prof. S. C. Dutta Roy https://nptel.ac.in/courses/108102042
2	Course on Network Analysis By Prof. Tapas Kumar Bhattacharya https://archive.nptel.ac.in/courses/108/105/108105159/
3	Course on Basic Electric Circuits By Prof. Ankush Sharma https://nptel.ac.in/courses/108104139

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B.Tech in Electrical Engineering

SoE No.
23EL-101

III SEMESTER

23EL1304 : Lab : Electrical Engineering Workshop

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Describe the basic concept of various electrical components.
2. Demonstrate, formulate and solve the basic maintenance and troubleshooting of household Equipments, energy saving etc.
3. Outline the fundamentals of major electrical devices and actual operation of devices like AC and DC machines.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	Experiments based on
1	To study the construction and working of ceiling fan and troubleshooting.
2	To find the fault of electric iron (ordinary and automatic) and study about them and prepare the maintenance chart of the possible faults and their remedies
3	To study about electric mixer and find out fault in it
4	To measure Earth Resistance by Earth Tester
5	To measure the value of insulation resistance of a given electrical equipment using the Megger instrument.
6	To construct the single phase centre tapped shell type transformer
7	To identify terminals and testing of DC Compound Motor
8	To assemble the Direct Online Starter – DOL Starter for Motors
9	To assemble the Star Delta Starter – (Y-Δ) for Motors
10	To demonstrate Solar Rooftop Installation
11	To study Electrical Insulator and Types of Insulator
12	To explain the basic design of a Transmission tower.
13	To study the Types of Electrical Power Cables (Sizes & Ratings)

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B.Tech in Electrical Engineering

**SoE No.
23EL-101**

III SEMESTER

23EL1305 : Electrical Machines

Course Outcomes:

1. Analyze the performance of Transformers.
2. Illustrate proficiency in understanding the performance of D.C. Machines
3. Evaluate the performance of Induction Motors.
4. Explain working of Special Machines.

Unit:1	Three Phase Transformer	7 Hours
Types of 3 phase transformers, Construction, Labelling of terminals, Vector Groups, Polarity marking & Test, Transformer connections and their comparative features, Open Delta Connection, Parallel operation of three phasetransformers, All day efficiency. Harmonics effect due to saturation. Contemporary Issues related to Topic		
Unit:2	D.C. Generator	8 Hours
Construction, Magnetic structure, Field and Armature systems, Field and Armature windings (Both Lap and Wave Types),EMF Equation, Characteristics and applications of different types of D.C. Generators, Building of Emf in D.C. Shunt generator, Armature reaction, commutation, straight line commutation, inter-poles, compensating winding. Contemporary Issues related to Topic		
Unit:3	D.C. Motor	7 Hours
Principle, Torque Equation, Characteristics and applications of various types of D.C. Motors, Starting of D.C. Motors, Speed control of Series and Shunt motors, Power flow in DC machines, Losses and Efficiency in D.C. machines. Contemporary Issues related to Topic		
Unit:4	Single Phase Induction Motor	8 Hours
Production of rotating magnetic field, Double-field revolving theory of Induction motor, Types of single phase Induction motors, Comparison of single phase and three phase Induction motor, Application of single phase Induction Motor. Contemporary Issues related to Topic		
Unit:5	Three Phase Induction Motor	7 Hours
Construction , Production of rotating magnetic field, Principle of operation, Speed and Slip, frequency of rotor voltage and current, Relationship between rotor copper loss and rotor input, Developed torque, Torque of an Induction Motor, Condition for maximum torque, Torque-slip and torque-speed characteristics. Equivalent circuit, No load and blocked rotor tests and determination of parameters of equivalent circuit, Losses and efficiency. Starting, Speed control, Crawling and Cogging, Application of three phase Induction Motor. Contemporary Issues related to Topic		

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Unit :6	Special Machines	8 Hrs
Double cage induction motor: principle, construction, torque slip characteristics. Induction Generator: principle, isolated operation, double fed induction generator, Applications. Stepper Motors, Permanent Magnet Brushless DC Motor: Constructional features, Principle of Operation, Torque prediction, Types, Applications. Contemporary Issues related to Topic		
Total Lecture Hours		45 Hours

Text books	
1	Dr. P. K. Mukherjee and S. Chakravarti, "Electrical Machines", Dhanpat Rai Publications (P) Ltd, 2nd Edition -1993
2	I.J.Nagrath and Dr. D.P.Kothari, "Electrical Machines", Tata McGraw Hill, 3rd Edition-2010
3	Ashfaq Husain, "Electric Machines", Dhanpat Rai Publications (P) Ltd., 2nd Edition-2014
4	K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
5	A.E.Fitzgerald, C.Kingsley, S.D.Umans, "Electrical Machinery", Tata McGraw Hill. Sixth Edition 2002.

Reference Books	
1	Alexander S. Langdorf, "D.C. Machines", Mcgraw-hill Book Company, 1915.
2	Nasser Syed, "Electrical Machines and Transformers", A New York, Macmillan 1984.
3	R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.
4	P.S.Bhimbra, 'Generalised Theory of Electrical Machine', Khanna Publishers, Edition 7th -2008.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-642-25904-3
2	http://link.springer.com/openurl?genre=book&isbn=978-1-4614-0399-9
3	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Machines/

MOOCs Links and additional reading, learning, video material	
1	https://archive.nptel.ac.in/courses/108/105/108105155/

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SoE No.
23EL-101

III SEMESTER

23EL1306 : Lab. Electrical Machines

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Analyze the performance of Transformers.
2. Illustrate proficiency in understanding the performance of D.C. Machines
3. Evaluate the performance of Induction Motors.
4. Explain working of Special Machines.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	Experiments based on
1	To study phasing out and polarity marking of a 3-phase transformer
2	To study voltage and current relations in a 3-phase, Delta-Star connected transformer
3	To perform Open Circuit and Short Circuit test on a 3-phase transformer
4	To plot magnetization characteristic of a DC generator
5	To study speed control of a DC shunt motor by varying – (a) field excitation and (b) armature voltage
6	To perform load test on a DC shunt motor
7	To study measurement of slip of a 3-phase induction motor by different methods
8	To study control of a 3-phase slip-ring induction motor by – (a) variation of a rotor resistance and (b) varying supply voltage
9	To perform open circuit test and blocked rotor test on a 3-phase induction motor
10	To perform load test on a 3-phase induction motor by direct loading.
11	To perform No-Load and Blocked rotor tests on a 1-phase induction motor
12	To study Induction generator operation.
13	To measure inrush current of three phase, 60 Hp induction motor

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23EL-101**

III SEMESTER

23EL1307 : Community Engagement Project

Course Outcomes:

Activities related to following topics will be undertaken under this lab:

1. Calculation of electrical load of a particular site
2. Safety measures to be undertaken to avoid accidents at domestic level.
3. Safety measures to be undertaken to avoid accidents at commercial level.
4. Measures to undertake for saving of electricity bill.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	Experiments based on
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

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III SEMESTER Multidisciplinary Minor Courses

Track 1

Courses	Sem	MDMT1EL101 : Electric Vehicles
MDM-I	3	(MDM1EL101) Introduction to Electric Vehicles
MDM-II	4	(MDM2EL102) Energy storage devices
MDM-III	5	(MDM3EL103) Electric Machines
MDM-IV	6	(MDM4EL104) Power Electronics and Motor drives
MDM-V	7	(MDM5EL105) Drives and Autonomous Vehicle
MDM-VI	8	(MDM6EL106) Hybrid Electric Vehicle

Track 2

Courses	Sem	MDMT2EL201 : Solar Engineering
MDM-I	3	(MDM1EL201) Introduction to Solar -Thermal Energy
MDM-II	4	(MDM2EL202) Semi-conductor material for Solar Photovoltaic cells
MDM-III	5	(MDM3EL203) Solar Power Plant Design
MDM-IV	6	(MDM4EL204) Solar rooftop:Design and Installation
MDM-V	7	(MDM5EL205) Technical and economic analysis of Solar PV
MDM-VI	8	(MDM6EL206) Applications of Solar Energy

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23EL-101**

III SEMESTER

MDM1EL101: Introduction to Electric Vehicles

Unit:1	Electric Vehicle	7 Hours
Introduction: History of EV, Components of Electric Vehicle, Comparison with Internal combustion Engine: Technology, Comparison with Internal combustion Engine: Benefits and Challenges, EV classification and their electrification levels.		
Unit:2	Types of EV Chargers	8 Hours
Electric Vehicle Technology and Charging Equipment's, Basic charging Block Diagram of Charger, Difference between Slow charger and fast charger, Slow charger design rating, Fast charger design rating, AC charging and DC charging, Inboard and off board charger specification, Type of Mode of charger Mode -2 , Mode-3 and Mode-4, EVSE associated charge times calculation.		
Unit:3	Selection and sizing of Common types of connectors and applications	7 Hours
Selection of AC charger type-1, type -2 and type -3, Communication between AC charger and EV, Selection of DC charger connector GB/T, CHAdeMO, CCS-1 and CSS-2, Communication methodology of DC fast chargers, IS/ IEC/ARAI/ standard of Charging topology, Communication and connectors (IEC 61851-1, IEC 61851-24,62196-2), Selection sizing of Charger connector cable.		
Unit:4	Public Charging infrastructure / Electrical system design	8 Hours
Assessment of site Location for Public charging station, Selection and Sizing of – Distribution transformer, HT Equipment (VCB, CT, PT, Metering), HT Cables and LT cables, Distribution Board / feeders, LT and HT cable, Compact Substation (CSS for EV CS)/ Power Substation), relay and calculation, EV Charger Single Line Diagram		
		30 Hours

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III SEMESTER

MDM1EL102: Introduction to Solar -Thermal Energy

Unit I: Flat plate collectors	(7 Hrs.)
Radiative Properties and Characteristics of Materials, Performance analysis, Transmissivity of the cover system, Transmissivity-Absorptivity product, Overall loss co-efficient and heat transfer calculations	
Unit II: Concentrating Collectors	(8 Hrs.)
General characteristics, Thermal analysis of concentrating collectors, Solar Concentration Ratio (C), Cylindrical parabolic collector	
Unit III: Thermal energy storage	(7 Hrs.)
Introduction, Sensible heat storage, Latent heat storage, Thermochemical storage	
Unit IV: Solar Pond	(8 Hrs.)
Introduction to Solar Pond, Description , Applications	
	30 Hours

Textbooks:

1.	Solar photovoltaic: Fundamentals, Technologies and Applications by Chetan Singh Solanki, Published by PHI
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Reference Books:

1.	B.H.Khan , “ Non Conventional Energy Resources” , 3rd edition 2017, Mc Graw Hill Publication
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YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1.	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20System%20Engineering/Principles%20of%20Power%20Systems%20V.K%20Mehta.pdf
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MOOCs Links and additional reading, learning, video material

1.	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems [Intro Video] http://103.152.199.179/YCCE/DTEL%20Material/3.Electrical%20Engineering/DTEL%20PPTs/IV%20SEMI-ESTER/EL-2253%20EEGS/
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B.Tech in Electrical Engineering

SoE No.
23EL-101

III SEMESTER

Open Elective -I : Basket

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	3	OE1	GE	23OE1301	OE-I : Combinatorics
2	3	OE1	GE	23OE1302	OE-I : Fuzzy Set Theory, Arithmetic And Logic
3	3	OE1	GE	23OE1303	OE-I : Green Chem. & Sustainability
4	3	OE1	GE	23OE1304	OE-I : Hydrogen Fuel
5	3	OE1	GE	23OE1305	OE-I : Electronic Materials And Applications
6	3	OE1	GE	23OE1306	OE-I : Laser Technology And Applications
7	3	OE1	MGT	23OE1307	OE-I : Finance And Cost Management
8	3	OE1	MGT	23OE1308	OE-I : Operation Research Techniques
9	3	OE1	MGT	23OE1309	OE-I : Project Evaluation & Management
10	3	OE1	MGT	23OE1310	OE-I : Total Quality Management
11	3	OE1	MGT	23OE1311	OE-I : Value Engineering
12	3	OE1	MGT	23OE1312	OE-I : Maintenance Management
13	3	OE1	MGT	23OE1313	OE-I : Industrial Safety
14	3	OE1	MGT	23OE1314	OE-I : Industry 4.0
15	3	OE1	MGT	23OE1315	OE-I : Operation Management
16	3	OE1	MGT	23OE1316	OE-I : Material Management
17	3	OE1	MGT	23OE1317	OE-I : Hospitality Management
18	3	OE1	MGT	23OE1318	OE-I : Human Resource Management & Organizational Behaviour
19	3	OE1	MGT	23OE1319	OE-I : Agri-Business Management
20	3	OE1	MGT	23OE1320	OE-I : Rural Marketing
21	3	OE1	MGT	23OE1321	OE-I : Marketing Management
22	3	OE1	MGT	23OE1322	OE-I : Health Care Management

Link for Open Electives syllabus: <https://ycce.edu/syllabus/>

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III SEMESTER

Mandatory Learning Course (Audit Course)

MLC2123 : YCAP3

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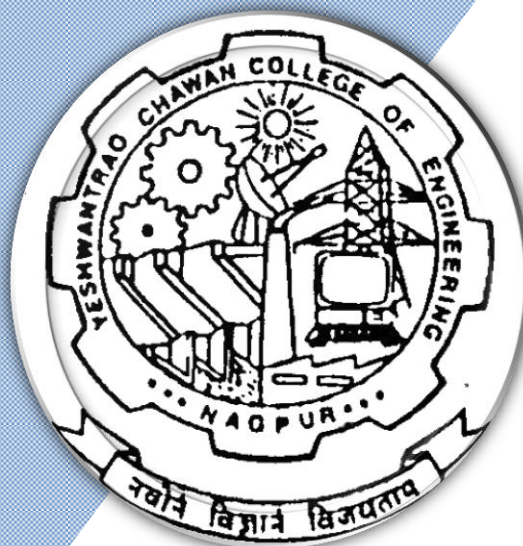
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Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

4th Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



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B.TECH SCHEME OF EXAMINATION 2023
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 (Department of Electrical Engineering)
 B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
FOURTH SEMESTER																
1	4	HSSM-2	GE	23GE1401	Entrepreneurship Development	T	2	0	0	2	2	30	20	50	3	
2	4	AEC-2	GE	23GE1405 23GE1406	Marathi Language Hindi Language	T	2	0	0	2	2	30	20	50	3	
3	4	PC	EL	23EL1401	Electrical Measurement and Instrumentation	T	3	0	0	3	3	30	20	50	3	
4	4	PC	EL	23EL1402	Lab : Electrical Measurement and Instrumentation	P	0	0	2	2	1		60	40		
5	4	PC	EL	23EL1403	Electrical Machines in Power System	T	3	0	0	3	3	30	20	50	3	
6	4	PC	EL	23EL1404	Lab : Electrical Machines in Power System	P	0	0	2	2	1		60	40		
7	4	VSEC-3	EL	23EL1405	Lab : Computer Programming	P	0	0	2	4	2		60	40		
8	4	VEC-2	EL	23EL1406	Digital Signal Processing	T	2	0	0	2	2	30	20	50	3	
9	4	MDM	EL		MD Minor Course-II	T	2	0	0	2	2	30	20	50	3	
10	4	OE-2	OE		Open Elective-II	T	2	0	0	2	2	30	20	50	3	
TOTAL							16	0	6	24	20					

List of Mandatory Learning Course (MLC)

1	4	HS	T&P	MLC2124	YCAP4 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Open Elective - II

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	4	OE2	GE	23OE2401	OE-II : Combinatorics
2	4	OE2	GE	23OE2402	OE-II : Fuzzy Set Theory, Arithmetic And Logic
3	4	OE2	GE	23OE2403	OE-II : Green Chem. & Sustainability
4	4	OE2	GE	23OE2404	OE-II : Hydrogen Fuel
5	4	OE2	GE	23OE2405	OE-II : Electronic Materials And Applications
6	4	OE2	GE	23OE2406	OE-II : Laser Technology And Applications
7	4	OE2	MGT	23OE2407	OE-II : Finance And Cost Management
8	4	OE2	MGT	23OE2408	OE-II : Operation Research Techniques
9	4	OE2	MGT	23OE2409	OE-II : Project Evaluation & Management
10	4	OE2	MGT	23OE2410	OE-II : Total Quality Management
11	4	OE2	MGT	23OE2411	OE-II : Value Engineering
12	4	OE2	MGT	23OE2412	OE-II : Maintenance Management
13	4	OE2	MGT	23OE2413	OE-II : Industrial Safety
14	4	OE2	MGT	23OE2414	OE-II : Industry 4.0
15	4	OE2	MGT	23OE2415	OE-II : Operation Management
16	4	OE2	MGT	23OE2416	OE-II : Material Management
17	4	OE2	MGT	23OE2417	OE-II : Hospitality Management
18	4	OE2	MGT	23OE2418	OE-II : Human Resource Management & Organizational Behaviour
19	4	OE2	MGT	23OE2419	OE-II : Agri-Business Management
20	4	OE2	MGT	23OE2420	OE-II : Rural Marketing
21	4	OE2	MGT	23OE2421	OE-II : Marketing Management
22	4	OE2	MGT	23OE2422	OE-II : Health Care Management
23	4	OE2	MGT	23OE2423	OE-II : Designated approved online NPTEL/KKSU Course
24	4	OE2	MGT	23OE2424	OE-II : Indian Archeology
25	4	OE2	MGT	23OE2425	OE-II : Social & Positive Psychology
26	4	OE2	MGT	23OE2426	OE-II : Seismology & Earthquake

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

IV SEMESTER

23GE1401 : Entrepreneurship Development

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Appreciate role of entrepreneurs in society and develop entrepreneurial abilities by providing information about skill sets.
2. Develop an understanding of how and what form of business organization to choose for start up.
3. Stimulate to innovate, develop prototypes or ideas by applying theory into practice.
4. Identify the Support rendered by various Government Agencies.

Unit I:

7 Hrs.

Entrepreneur & Entrepreneurship: Meaning of Entrepreneur, Evolution of the concept – Theories and Models, Types of Entrepreneur, Stages in entrepreneurial process- Idea Generation, Screening, Selection and Managing Resources.

Unit II:

8 Hrs.

Legal Compliances for Incorporating Start up: Fundamentals of choosing the Business Organization form for startup, Incorporation of Partnership, LL.P & Co – operative, Incorporation of One Person Company, Pvt. Ltd., Pub. Ltd. and not for profit company, Financing the legal Venture and Legal Compliances.

Unit III:

7 Hrs.

Entrepreneurship and IP Strategy: Intellectual Property : Definition and Concept of Trade Mark, Patent, Copyright, Industrial Design, IP Strategy and Entrepreneurship.

Unit IV:

8 Hrs.

Support to Entrepreneurs: Financing new ventures, Business Incubators – Government Policy for Small Scale Enterprises, Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Subcontracting.

Total Lecture

30 Hours

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

**SoE No.
23EL-101**

IV SEMESTER

23EL1401: Electrical Measurement & Instrumentation

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Discuss the working principle of measuring instruments and circuit parameters
2. Explain the concepts of measurement of power and Energy.
3. Illustrate the fact and ideas related to instrument transformer.
4. Apply the knowledge of analog and digital instruments with transducers to measure physical quantities

Unit:1	Measuring Instruments	7 Hours
Electrical Measurement : Classification of Instruments , Deflection and null type instruments ,forces acting in Indicating instruments , Construction and working principle of PMMC and MI type instruments , Measurement of Resistance : Classification of Resistance, Wheatstone bridge , Kelvin's Double Bridge , Loss of charge method. Construction and working principle of Megger , Measurement of Earth Resistance.		
Contemporary Issues related to Topic		
Unit:2	Potentiometers and AC Bridges	8 Hours
D.C. Potentiometer: Basic Potentiometer circuit, Lab Type Potentiometer voltage ratio box. A.C. Potentiometer:- Standardization of AC Potentiometer, Drysdale Polar potentiometer, Gall-Tinsley (Co-ordinate type) Potentiometer. AC Bridges: General equation of AC bridge balance, measurement of Inductance by Maxwell Inductance-capacitance Bridge, detectors used in AC Bridges, Measurement of Capacitance By High voltage Schering bridge , Measurement of Relative Permittivity by Schering bridge, Measurement of frequency By Wien's Bridge.		
Contemporary Issues related to Topic		
Unit:3	Measurement of Power and Energy	7 Hours
Wattmeter : Construction and operation of Electrodynamometer type wattmeter , LPF Wattmeter, Measurement of power using instrument transformer, Blondal's Theorem , Measurement of three phase power By single wattmeter, Two wattmeter , and Three wattmeter method , measurement of Reactive power for Balanced load using single wattmeter method. Energy Measurement : Induction type Energy meter (construction and operating principle)Errors and their compensation , Two element energy meter , maximum demand energy meter , phantom Loading (Merz – price). Power factor Meter : Three phase Electrodynamometer type power factor meter.		
Contemporary Issues related to Topic		

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Unit:4	Instrument Transformers	8 Hours
Instrument Transformer : Use of instrument transformer , ratios in instrument transformer , burden , characteristics of CT , Effect of secondary open in CT. Potential transformer : Difference between CT and PT , Errors in PT , Reduction of errors in PT , characteristics of PT.		
Unit:5	Analog Transducers	7 Hours
Transducers: Introduction, Types (Piezoelectric Transducer, Active , Passive transducers) Transducers : Transducers required for the measurement of (Non electrical quantities) Linear displacement ,(LVDT), Strain , (Strain gauge, Un bounded metal Strain gauge, semi conductor Strain gauge),Pressure (Bourden Tube,Bellows, Pirani Gauge),Torque , Linear velocity, Angular Velocity Temperature,(Thermocouples ,First and Second Law of Thermocouple, Thermistors , Bimetallic Thermocouples), Flow (Electromagnetic Flow meter), Acceleration : LVDT Accelerometer. Digital Encoding transducers – Contacting or Brush type, Shaft encoder. Contemporary Issues related to Topic		
Unit :6	Digital Instruments and Transducers	8 Hours
Digital Voltmeters, Digital Ammeters: Ramp type digital Voltmeter and Ammeter, Integrating type digital voltmeter and ammeter. Digital Frequency Meter: Basic circuit, Time base, start and stop Gate circuit for measurement of frequency. Electrical resonance type frequency meter, Weston frequency meter Contemporary Issues related to Topic		
Total Hours		45 Hours

Student activities:

1. Interview at least four entrepreneurs or businessman and identify Traits of successful entrepreneurs.
2. Analyse case studies of any two successful entrepreneurs.
3. Download product development and innovative films from internet.
4. Identify your hobbies and interests and convert them into business idea

Textbooks

1. Khanka. S.S., “Entrepreneurial Development” S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko, “Entrepreneurship – Theory, Process and Practice”, 9th Edition, Cengage Learning 2014.
3. Corporate Law, 33rd ed. 2016, Taxman New Delhi.
4. Narayanan, V. K., Managing technology and innovation for competitive advantage, first edition, Pearson education, New Delhi, (2006)
5. Idris, K. (2003), Intellectual property: a power tool for economic growth, second edition, WIPO publication no. 888, Switzerland
6. Khanka. S.S., “Entrepreneurial Development” S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
7. Ramaiya's Guide to the Companies Act, 18th ed. 2014, Lexis Nexis New Delhi.

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Reference Books

1. Mehta, Monica- The Entrepreneurial Instinct : How everyone has the innate ability to start a successful small business – McGraw – Hill Education, New Delhi 2012, ISBN 978-0-07-179742-9
2. Prasanna Chandra “Protect Preparation, Appraisal, Implementation” Tata McGraw Hill. New Delhi
3. S Anil Kumar “Entrepreneurship Development” New Age International Publishers
4. Nishith Dubey “Entrepreneurship Development” PHI Learning

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 <http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0>
- 2 <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042>

MOOCs Links and additional reading, learning, video material

- 1 https://onlinecourses.swayam2.ac.in/cec23_mg24/course- entrepreneurship development
- 2 https://onlinecourses.nptel.ac.in/noc23_mg74/announcements?force=true-entrepreneur
- 3 https://onlinecourses.nptel.ac.in/noc23_mg126/announcements?force=true- Business fundamentals for entrepreneurship

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SoE No.
23EL-101

IV SEMESTER

23EL1402: Lab. Electrical Measurement & Instrumentation

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Discuss the working principle of measuring instruments and circuit parameters
2. Explain the concepts of measurement of power and Energy.
3. Illustrate the fact and ideas related to instrument transformer
4. Apply the knowledge of analog and digital instruments with transducers to measure physical quantities

Minimum Eight Practical's to be performed from the list as below

Sr. No.	Experiments based on
1	To find high resistance using loss of charge method
2	To determine low resistance using Kelvin's double bridge.
3	To compute medium resistance using Wheatstone bridge
4	To measure inductance using Anderson's bridge.
5	To evaluate three phase power using two wattmeter method
6	To calculate electrical energy using electromechanical energy meter
7	To measure capacitance using Schering Bridge
8	Testing of single phase induction type energy meter
9	To calculate reactive power in balanced three phase ac circuit using single wattmeter.
10	To explain working of Strain gauge
11	To estimate Torque using sensors.
12	To explain working of an instrumentation amplifier
13	To explain working of Cathode Ray Oscilloscope.

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SoE No.
23EL-101

IV SEMESTER

23EL1403: Electrical Machines in Power System

Course Outcomes:

1. Analyze steady state performance of synchronous machines
2. Illustrate Synchronization, load sharing and effect of variable excitation in parallel operation of alternators.
3. Evaluate the performance of Synchronous machine connected to infinite bus.
4. Describe the transient behaviour of Synchronous Machine.

Unit:1	Armature Winding	7 Hours
Full pitch coil, short pitched coil, Coil span factor, concentrated winding, distributed winding, distribution factor, introduction to armature winding and field winding, MMF of armature winding, induced EMF with and without harmonics.		
Contemporary Issues related to Topic		
Unit:2	Steady State Operation of Three phase synchronous generators	8 Hours
Introduction, Constructional features of cylindrical and salient pole rotor machines, Effect of loading on terminal voltage, Armature reaction, Effect of load power factor on armature reaction, concept of synchronous reactance, Phasor diagram on load, regulation by Direct loading, Emf method, Load characteristics, External Characteristic, Zero power factor characteristics (ZPFC), construction of Potier triangle..		
Contemporary Issues related to Topic		
Unit:3	Parallel Operation of Synchronous Generators	7 Hours
Conditions of synchronization of generator with another generator and or Infinite busbars, Parallel operation, Loadsharing between parallel connected generators. Effect of variable excitation and power input (speed) on generator operation		
Contemporary Issues related to Topic		
Unit:4	Synchronous Motor	8 Hours
Principle of operation, Methods of starting, phasor diagram, expression for torque, Excitation Emf, load/torque angle, Effect of variable excitation and load on motor operation, V and inverted V curves, Concept of synchronous condenser, Introduction to Permanent Magnet Synchronous motor, Reluctance and Hysteresis motor.		
Contemporary Issues related to Topic		
Unit:5	Synchronous Machine Connected to Infinite Bus	7 Hours
Power Angle Characteristic of Synchronous machines with and without armature resistance. Expression forelectrical and electromechanical power developed, losses and efficiency in synchronous machines.		
Contemporary Issues related to Topic		

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Unit :6	Transient Behaviour	8 Hours
Short circuit ratio, unbalanced Loading, Sequence Component, Sudden 3-phase short circuit, Constant flux linkage theorem, Transient and sub-transient reactances, Time constants and equivalent circuit diagram, role of damper winding in both generator and motor operation. Experimental determination of steady state & transient parameters		
Contemporary Issues related to Topic		
Total Lecture Hours		45 Hours

Text books

1	Dr. P. K. Mukherjee and S. Chakravarti, "Electrical Machines", Dhanpat Rai Publications (P) Ltd ,Edition 2nd -1993
2	I.J.Nagrath and Dr. D.P.Kothari, "Electrical Machines", Tata McGraw Hill ,edition 3rd -2010.

Reference Books

1	M.G. Say , "Alternating Current Machines", Publishers ,Edition 1st -1983
2	P.S.Bhimbra , "Electrical Machinery", Khanna Publisers, Edition 7TH -2008.
3	A.E.Fitzgerald, C.Kingsley, S.D.Umens , "Electrical Machinery", Mc Graw Hill, Edition 1ST-1985
4	Ashfaq Husain , "Electric Machines", Dhanpat Rai Publications (P) Ltd., 2nd -2008

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://link.springer.com/openurl?genre=book&isbn=978-3-642-25904-3
2	http://link.springer.com/openurl?genre=book&isbn=978-1-4614-0399-9
3	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Machines/

MOOCs Links and additional reading, learning, video material

1	https://archive.nptel.ac.in/courses/108/105/108105131/
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SoE No.
23EL-101

IV SEMESTER

23EL1404 : Lab. Electrical Machines in Power System

Course Outcomes:

1. Analyze steady state performance of synchronous machines
2. Illustrate Synchronization, load sharing and effect of variable excitation in parallel operation of alternators.
3. Evaluate the performance of Synchronous machine connected to infinite bus.
4. Describe the transient behaviour of Synchronous Machine.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	Experiments based on
1	To determine voltage regulation of an alternator by direct loading
2	To determine voltage regulation of an alternator by synchronous impedance method.
3	To plot external characteristics of synchronous generator at different power factor loads
4	To perform slip test on a 3-phase synchronous machine.
5	To study synchronization of a 3-phase alternator with infinite bus-bars.
6	To determine sub-transient reactance of synchronous machine.
7	To determine negative sequence reactance of a 3-phase synchronous machine
8	To determine zero sequence reactance of a 3-phase synchronous machine.
9	To observe armature voltage and current waveforms of a 3-phase alternator during slip-test on C.R.O.
10	To plot V and inverted V curves of a 3-phase synchronous motor

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23EL-101

IV SEMESTER

23EL1405 : Lab : Computer Programming

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Explain various programming constructs of SCILAB
2. Develop programs using SCILAB
3. Analyse and plot the results using SCILAB

Minimum Eight Practical's to be performed from the list as below

Sr. No.	Experiments based on
1	To discuss functions and keywords of SCILAB
2	To demonstrate operations on matrices
3	To Construct a function and demonstrate how functions are called
4	To Solve linear differential equations
5	To Calculate the roots of quadratic equation using if else statement
6	To Construct a function that returns the mean and standard deviation of a vector of numbers
7	To Construct a function that reverses the order of letters in a string, and returns the new string
8	To Compute the power factor of the RL series circuit. Plot the voltage and current
9	To Create the vector $0:\pi/20:2*\pi$ and use it to sample the $\sin()$ function. Plot the results with labels
10	To Determine the mesh currents for the given circuit diagram
11	Determine the node voltages for the given circuit diagram
12	Observe the for loop construct in Vlabs
13	Observe the if else, if else if constructs in Vlabs

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IV SEMESTER

23EL1406 : Digital Signal Processing

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Classify mathematical representation of signals and systems in various domains.
2. Determine and analyze signals in time and frequency domain using Fourier series and Fourier transform.
3. Evaluate and analyze signals using Z-transform.
4. Analyze and design digital filter

Unit:1	Continuous and Discrete time signals	7 Hours
Continuous and discrete Signal representation, classification of signals, Signal Energy and Power, Periodic, Even & Odd, Real and Exponential Signals Discrete Signal properties: Linearity, causality, stability, static/dynamic. Time invariance/Time variance Convolution		
Unit:2	Fourier Series Representation of Periodic Signals	8 Hours
Fourier Series Representation of Continuous-Time Periodic Signals. Convergence of the Fourier Series. Properties of Continuous-Time Fourier Series. Fourier Series Representation of Discrete-Time Periodic Signals. Properties of Discrete-Time Fourier Series.		
Unit:3	Fourier Transform and Z-Transform	7 Hours
Fourier Transform - Convergence of Fourier Transform and its Properties, Representation of Aperiodic Signals, The Fourier Transform for Periodic Signals. Z-Transform - The Region of Convergence for the z-Transform. The Inverse z-Transform. Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot. Properties of the z-Transform. Block Diagram Representations. The Unilateral z-Transform.		
Unit:4	Introduction to Digital Signal Processing	8 Hours
Sampling theorem, Basic Digital Filtering, FIR, and IIR Filter Designs		
Total Lectures		30 Hours

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Text books

- | | |
|---|--|
| 1 | Signals and Systems 2nd Edition, 2013, Alan V. Oppenheim, Alan S. Willsky, with S. Hamid |
|---|--|

Reference Books

- | | |
|---|--|
| 1 | Signals & Systems, 2nd Edition., 2005 Simon Haykin and Van Veen Wiley |
| 2 | Signals, Systems and Transforms 3rd Edition, 2004 C. L. Philips, J.M. Parr and Eve A. Riskin Pearson education |
| 3 | Schaum's Outlines of Signals and Systems 3rd Edition, 2002 Hwei P. Hsu McGraw Hill |
| 4 | Linear Systems and Signals 2nd Edition B.P. Lathi Oxford University Press |

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- | | |
|---|---|
| 1 | http://link.springer.com/openurl?genre=book&isbn=978-1-4614-5331-4 |
| 2 | http://link.springer.com/openurl?genre=book&isbn=978-3-540-92953-6 |

MOOCs Links and additional reading, learning, video material

- | | |
|---|--|
| 1 | npTEL video lect/ https://youtu.be/xrVWB9VYZ64 by Prof. Aditya K. Jagannatham |
| 2 | npTEL video lect/ https://youtu.be/7Z3LE5uM-6Y by Prof. K.S. Venkatesh |

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23EL-101**

IV SEMESTER
Multidisciplinary Minor Courses

Track 1

Courses	Sem	MDMT1EL101 : Electric Vehicles
MDM-I	3	(MDM1EL101) Introduction to Electric Vehicles
MDM-II	4	(MDM2EL102) Energy storage devices
MDM-III	5	(MDM3EL103) Electric Machines
MDM-IV	6	(MDM4EL104) Power Electronics and Motor drives
MDM-V	7	(MDM5EL105) Drives and Autonomous Vehicle
MDM-VI	8	(MDM6EL106) Hybrid Electric Vehicle

Track 2

Courses	Sem	MDMT2EL201 : Solar Engineering
MDM-I	3	(MDM1EL201) Introduction to Solar -Thermal Energy
MDM-II	4	(MDM2EL202) Semi-conductor material for Solar Photovoltaic cells
MDM-III	5	(MDM3EL203) Solar Power Plant Design
MDM-IV	6	(MDM4EL204) Solar rooftop:Design and Installation
MDM-V	7	(MDM5EL205) Technical and economic analysis of Solar PV
MDM-VI	8	(MDM6EL206) Applications of Solar Energy

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23EL-101

IV SEMESTER

Track1 : MDMT1EL101 : Electric Vehicles

MDM2EL102: Energy Storage Devices

Course Outcomes:

Upon successful completion of the course the students will be able to

1. To understand the fundamentals of advanced batteries, their sizing, and applications of super-capacitors.
2. To understand the aspects of battery hybridization, and fuel reforms.
3. To understand the various battery recycling, testing procedures, and verification of battery performances.
4. To understand the battery management systems, thermal management systems, and aspects of battery safety.

Unit:1	BATTERIES	7 Hours
Advanced Lithium-iron (Li-ion) battery, Nickel-metal hybrid battery, Advanced Nickel-metal hydride battery (Ni-MH) batteries for transportation, Advanced lead-acid batteries, applications of batteries for use of High-temperature, load leveling, large-scale grid operation, and space.		
Unit:2	Battery hybridization and its application	8 Hours
Hybridization and the applications of Battery and Supercapacitor, Battery and Fuel-Cell, Battery and Solar-Cell, Battery and Wind Turbine		
Unit:3	Battery Recycling Technologies, Battery Chargers, and Battery Testing Procedures	7 Hours
Technology and economic aspects of battery recycling, its applications, Constant current and constant voltage methods, Hybrid methods, Inductive chargers, Battery testing.		
Unit:4	Battery Management Systems (BMS)	8 Hours
Fundamentals of battery management systems and controls, passive and active cooling, regulations and safety aspects of high voltage batteries using codes and standards, Safe handling of lithium batteries, the safety of high voltage devices.		
		30 Hours

Text Books:

Sr. No.	Title	Author Details	Publication Details
1	Battery Technology Handbook	A. Kiehne	Marcel Dekker, NYC, 2003
3	Handbook of Batteries, 3rd Edition	D. Linden and T. S. Reddy	McGraw-Hill, 2002
4	Maintenance-Free Batteries	D. Berndt	John Wiley & Sons, NY, 1997

References:

Sr. No.	Title	Author Details	Publication Details
1	Electric Vehicle Technology Explained	James Larminie and John Lowry	John Wiley, NY, 2003

Online Resources

Sr. No.	Link
1	https://archive.nptel.ac.in/courses/113/105/113105102/

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IV SEMESTER

Track2 : MDMT2EL201 : Solar Engineering

MDM2EL202: Semi-conductor material for Solar Photovoltaic cells

Unit I: Fundamentals of semi-conductor	(7 Hrs.)
Semi-conductors as solar cell material, arrangements of atoms in space, Bohr model of Hydrogen atom	
Metal, insulator and semiconductor, direct and indirect band gap, charge carriers in semiconductors, carrier motion in semiconductors	
Unit II: An introduction to solar cell	(7 Hrs.)
P-N junction-equilibrium condition, P-N junction in non-equilibrium condition, P-N junction under illumination, generation of photo voltage, light generated current, I-V equation of solar cell, solar cell characteristics.	
Unit III: Design of solar cell	(8 Hrs.)
Upper Limits of cell parameter: short circuit current, open circuit voltage, fill factor, efficiency	
Losses in solar cell	
Unit IV: Solar cell technologies	(7 Hrs.)
Production of Si, Si wafers, Si sheets, Si uses in solar PV, Use of Anti-reflective coating , introduction to bifacial solar cell.	
Total Lecture	30 Hours

Textbooks:	
1.	C.S.Solanki, Solar Photovoltaics - Fundamentals, Technologies and Applications, 2nd edition 2013, PHI Publication
Reference Books:	
1.	B.H.Khan , “ Non Conventional Energy Resources” , 3rd edition 2017, Mc Graw Hill Publication
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1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20System%20Engineering/Principles%20of%20Power%20Systems%20V.K%20Mehta.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Renewable%20Energy%20Sources/B.H.Khan%20Book%20RES.pdf
3	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Renewable%20Energy%20Sources/Solar%20Energy%20pdf.pdf
MOOCs Links and additional reading, learning, video material	
1	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems [Intro Video]
2	http://103.152.199.179/YCCE/DTEL%20Material/3.Electrical%20Engineering/DTEL%20PPTs/IV%20SEMESTER/EL-2253%20EEGS/

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

IV SEMESTER Open Elective -II : Basket

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	4	OE2	GE	23OE2401	OE-II : Combinatorics
2	4	OE2	GE	23OE2402	OE-II : Fuzzy Set Theory, Arithmetic And Logic
3	4	OE2	GE	23OE2403	OE-II : Green Chem. & Sustainability
4	4	OE2	GE	23OE2404	OE-II : Hydrogen Fuel
5	4	OE2	GE	23OE2405	OE-II : Electronic Materials And Applications
6	4	OE2	GE	23OE2406	OE-II : Laser Technology And Applications
7	4	OE2	MGT	23OE2407	OE-II : Finance And Cost Management
8	4	OE2	MGT	23OE2408	OE-II : Operation Research Techniques
9	4	OE2	MGT	23OE2409	OE-II : Project Evaluation & Management
10	4	OE2	MGT	23OE2410	OE-II : Total Quality Management
11	4	OE2	MGT	23OE2411	OE-II : Value Engineering
12	4	OE2	MGT	23OE2412	OE-II : Maintenance Management
13	4	OE2	MGT	23OE2413	OE-II : Industrial Safety
14	4	OE2	MGT	23OE2414	OE-II : Industry 4.0
15	4	OE2	MGT	23OE2415	OE-II : Operation Management
16	4	OE2	MGT	23OE2416	OE-II : Material Management
17	4	OE2	MGT	23OE2417	OE-II : Hospitality Management
18	4	OE2	MGT	23OE2418	OE-II : Human Resource Management & Organizational Behaviour
19	4	OE2	MGT	23OE2419	OE-II : Agri-Business Management
20	4	OE2	MGT	23OE2420	OE-II : Rural Marketing
21	4	OE2	MGT	23OE2421	OE-II : Marketing Management
22	4	OE2	MGT	23OE2422	OE-II : Health Care Management

Link for Open Electives syllabus: <https://ycce.edu/syllabus/>

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B. Tech SoE and Syllabus 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Electrical Engineering)

B.Tech in Electrical Engineering

**SoE No.
23EL-101**

IV SEMESTER

Mandatory Learning Course (Audit Course)

MLC2124 : YCAP4

			July, 2023	1.00	Applicable for AY 2023-24 Onwards
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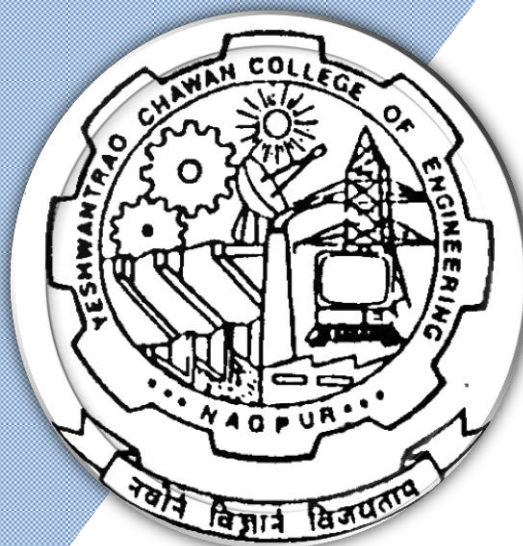
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(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

5th Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



Nagar Yuwak Shikshan Sanstha's
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B.TECH SCHEME OF EXAMINATION 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

**SoE No.
23EL-101**

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
FIFTH SEMESTER																
1	5	PC	EL	23EL1501	Control System	T	3	0	0	3	3	30	20	50	3	
2	5	PC	EL	23EL1502	Lab : Control System	P	0	0	2	2	1		60	40		
3	5	PC	EL	23EL1503	Power Electronics	T	3	0	0	3	3	30	20	50	3	
4	5	PC	EL	23EL1504	Lab : Power Electronics	P	0	0	2	2	1		60	40		
5	5	PC	EL	23EL1505	Fundamentals of Power System	T	3	0	0	3	3	30	20	50	3	
6	5	PC	EL	23EL1506	Lab : Power System	P	0	0	2	2	1		60	40		
7	5	PE	EL		Professional Elective-I	T	3	0	0	3	3	30	20	50	3	
8	5	PE	EL		Professional Elective-II	T	3	0	0	3	3	30	20	50	3	
9	5	OE-3	OE		Open Elective-III	T	3	0	0	3	3	30	20	50	3	
10	5	MDM	EL		MD Minor Course-III	T	3	0	0	3	3	30	20	50	3	
11	5	STR	EL	23EL1507	Internship and Indsutrial Visit	P	0	0	2	2	1		60	40		
TOTAL							21	0	8	29	25					

List of Mandatory Learning Course (MLC)

1	5	HS	T&P	MLC2125	YCAP5 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Professional Elective - I

1	5	PE-I	EL	23EL1521	PE-I : Electric and Magnetic Field										
2	5	PE-I	EL	23EL1522	PE-I : Electrical Machine Design										
3	5	PE-I	EL	23EL1523	PE-I : Design of Photovoltaic System										
4	5	PE-I	EL	23EL1524	PE-I : Electric Power Utilization										
5	5	PE-I	EL	23EL1525	PE-I : Applications of Renewable Energy Sources										
6	5	PE-I	EL	23EL1526	PE-I : Optimization Techniques										
7	5	PE-I	EL	23EL1527	PE-I : Thermal Power Plant Familiarization										

Professional Elective - II

1	5	PE-II	EL	23EL1541	PE-II : Illumination Engineering(MOOC)										
2	5	PE-II	EL	23EL1542	PE-II : Electrical Wiring: Estimation and Costing										
3	5	PE-II	EL	23EL1543	PE-II : Sensors and Actuators										
4	5	PE-II	EL	23EL1544	PE-II : Distributed Generations in Power System										
5	5	PE-II	EL	23EL1545	PE-II : 8085 Programming										
6	5	PE-II	EL	23EL1546	PE-II : Analog and Digital Electronics										

Coursera Elective

1	5	PE-II	EL	23EL1547	PE-II : Power Electronics Specialization										
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Open Elective - III

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	FACULTY
1	5	OE3	CSE	23OE3501	OE-III : Social Reformers in Modern Maharashtra	ARTS
2	5	OE3	CSE	23OE3502	OE-III : Independent India 1948-2010	ARTS
3	5	OE3	CT	23OE3503	OE-III : Introduction To Cognitive Psychology	ARTS
4	5	OE3	CT	23OE3504	OE-III : Introduction To Engineering Psychology	ARTS
5	5	OE3	CT	23OE3505	OE-III : Introduction To Behavioural Psychology	ARTS
6	5	OE3	CT	23OE3506	OE-III : Introduction To Emotional Psychology	ARTS
7	5	OE3	EL	23OE3507	OE-III : Elements of Public Administration	ARTS
8	5	OE3	ETC	23OE3508	OE-III : Ancient Indian History	ARTS
9	5	OE3	IT	23OE3509	OE-III : Consciousness Studies	ARTS
10	5	OE3	IT	23OE3510	OE-III : Psychology for Professionals	ARTS
11	5	OE3	IT	23OE3511	OE-III : Introduction to Sociology and Human Behavior	ARTS
12	5	OE3	GE	23OE3512	OE-III : Economics of Money and Banking	ARTS
13	5	OE3	GE	23OE3513	OE-III : Economics of Capital Market	ARTS
14	5	OE3	GE	23OE3514	OE-III : Digital Humanities	ARTS
15	5	OE3	GE	23OE3515	OE-III : Introduction to Political Science	ARTS
16	5	OE3	CT	23OE3516	OE-III : Bhagwat Geeta - An Engineer's Interpretation	ARTS - IKS
17	5	OE3	CT	23OE3517	OE-III : Artha shastra by Kautiliya	ARTS - IKS
18	5	OE3	CSD	23OE3518	OE-III : Glimpses of Ancient science and Technology	ARTS - IKS
19	5	OE3	CV	23OE3519	OE-III : Indian taxation system	COMMERCE
20	5	OE3	CV	23OE3520	OE-III : Elements of share trading	COMMERCE
21	5	OE3	EE	23OE3521	OE-III : Introduction to Fintech	COMMERCE
22	5	OE3	EE	23OE3522	OE-III : Financial Analytics	COMMERCE
23	5	OE3	ETC	23OE3523	OE-III : Fundamentals of Investments	COMMERCE
24	5	OE3	EE	23OE3524	OE-III : Lifestyle Diseases	HEALTHCARE & MEDICINE
25	5	OE3	EE	23OE3525	OE-III : Holistic Nutrition	HOME SCIENCE
26	5	OE3	EL	23OE3526	OE-III : Community Organization & Development	HOME SCIENCE
27	5	OE3	CSE	23OE3527	OE-III : Human Rights & International Laws	LAW
28	5	OE3	CSE	23OE3528	OE-III : Cyber Crime Administration	LAW
29	5	OE3	MATHS	23OE3529	OE-III : Finite Differences & Numerical Methods	SCIENCE
30	5	OE3	MATHS	23OE3530	OE-III : Business Statistics	SCIENCE
31	5	OE3	PHY	23OE3531	OE-III : Crystalline Solids: Properties and Applications.	SCIENCE
32	5	OE3	PHY	23OE3532	OE-III : Nanotechnology: Fundamental to Applications	SCIENCE
33	5	OE3	CHE	23OE3533	OE-III : Chemistry in daily life	SCIENCE
34	5	OE3	CHE	23OE3534	OE-III : Battery Systems and Management	SCIENCE
35	5	OE3	NPTL	23OE3535	OE-III : Designated approved online NPTEL Course	NPTL

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

V SEMESTER

23EL1501: Control System

Course Outcomes:

Upon successful completion of the course the students will be able to

- 1) Develop mathematical model for physical systems and evaluate their transfer function
- 2) Justify the need of negative feedback in control systems
- 3) Determine different time response specifications and analyze system response in time domain
- 4) Analyze system response in frequency domain using Bode plot

Unit:1	Introduction to Control Systems	7 Hours
History of control system, Basic Components of Control System, Open loop control and close loop control with examples, classification of control systems. Transfer Function, Block Diagram and Signal Flow Graph: Transfer function and gain, Order of a system, block diagram algebra & reduction techniques, signal flow graph, its constructions and Mason's gain formula. Mathematical Modelling of Physical Systems: Mathematical modelling of physical systems such as – electrical, mechanical, electro-mechanical, thermal, hydraulic, pneumatic, etc., Analogous systems.		
Unit:2	Characteristics of Feedback Control Systems	8 Hours
Effect of negative feedback compared to open loop system, such as sensitivity to parameter variation, speed of time response, bandwidth, disturbance rejection, and linearizing effect, Effect of positive feedback		
Unit:3	Time Domain Analysis of Control Systems	7 Hours
Concept of transient response, Steady state response and time response, standard test signals, Time response of first order systems, Transfer function of second order system, Time response of second order system, Time response specifications of second order system, steady state error (ess) analysis, static error constants and system type, dominant poles, Approximation of high order systems by low order systems, Relation between roots of characteristic equation, damping ratio and transient response, effect of proportional(P), Integral (I) and derivative (D) controllers on the time response concept of transportation lag.		
Unit:4	Stability of Linear Control Systems	8 Hours
Concept of stability, stable, unstable and marginally stable system, Absolutely stable and conditionally stable system, Necessary conditions for stability, method to determine stability, Routh-Hurwitz stability criterion with special cases, relative stability analysis. State Variable Analysis : Concept of state, state variables and state model, state model of linear systems, state model using physical variables, phase variables and canonical variables, state model from differential equations, block diagram and signal flow graph, transfer function from state model, stability of systems modeled in state variable form, solution of state equations, state transition matrix, its properties and computation.		
Unit:5	Root Locus Technique	8 Hours
Definition, magnitude and angle criteria, properties of root locus, construction rules for root locus plot of negative feedback systems, determining the gain from root locus plot, effect of addition of poles and zeros of $G(s)H(s)$.		
Unit:6	Frequency domain analysis of control systems	7 Hours
Concept of frequency response and sinusoidal transfer function, resonant frequency, resonant peak, cut off frequency, bandwidth, correlation between time and frequency response, polar plot, inverse polar plot, bode plot, all pass and minimum – phase system, experimental determination of transfer function, log magnitude versus phase plot. Stability in Frequency domain : Principle of argument, Nyquist stability criterion, Assessment of relative stability using Nyquist criterion, concept of gain margin and phase margin and its computation using polarplot and log magnitude versus phase plot. Constant M and constant N circles, Nicholas chart.		
Total Lecture Hours		45 Hours

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23EL-101**

V SEMESTER

23EL1501 : Control System

Text books

- 1 Control System Engineering, 5th Edition, I. J. Nagrath & M. Gopal, New Age International
- 2 Automatic Control Systems, 7th Edition, B. C. Kuo, PHI Learning Private Limited

Reference Books

- 1 Control Systems, 1st Edition, Ashok Kumar, McGraw-Hill Publication
- 2 Control Systems: Principles and Design, 4th Edition, M. Gopal, McGraw-Hill
- 3 Modern Control Engineering, 5th Edition, Katsuhiko Ogata, PHI Learning Private Limited

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 <http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Control%20system/Control%20Systems%20Engineering.%20By%20I.J.%20Nagrath.pdf>

MOOCs Links and additional reading, learning, video material

- 1 <https://youtu.be/Cl23xQrvFhk?feature=shared>
- 2 <https://youtu.be/RcuGxWc0HyQ?feature=shared>
- 3 <https://youtu.be/RcuGxWc0HyQ?feature=shared>

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SoE No.
23EL-101

V SEMESTER

23EL1502: Lab: Control System

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Illustrate the operation of control system components
2. Justify the use of advance tools such as MATLAB for analysis of control systems
3. Analyze control systems for their time response specifications.
4. Perform laboratory experiments and demonstrate competency in collecting, interpreting, analysing data, communicate and present effectively through laboratory journals.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	To study transient response of a second order system.
2	Study of Stepper Motor
3	Study of Potentiometer as an Error Detector.
4	To study the Speed Torque Characteristic of AC Servo Motor
5	To study the Frequency Response of RLC network
6	To study the Synchros To plot the characteristics of Synchro transmitter. To plot the characteristics of Synchro receiver
7	Study of synchro as an error detector
8	Study of DC Position Servo Mechanism
9	Verification of Root Locus using MATLAB
10	Verification of Bode Plot using MATLAB
11	To Study the Effect of the Type of System on Steady State Error
12	To study PID Controller

V SEMESTER

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23EL1503 : Power Electronics

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Demonstrate the working, characteristics, and show the need of protection of power semiconductor devices and select them for suitable application.
2. Analyze controlled single- and three-phase rectifiers, and cycloconverters
3. Demonstrate and examine the working and performance of DC – DC converters (Choppers).
4. Classify the different single and three phase DC/AC inverters and evaluate their performance.

Unit:1	Power Semiconductor Devices	7 Hours
SCR and its characteristics, Gate characteristics, SCR turn off Methods, ratings. Series and parallel connections of SCRs, TRIAC.		
Unit:2	Single Phase Line Commutated Converters	8 Hours
Single phase line commutated converters, single pulse converter, single phase bridge converter, effect of source inductance, effect of freewheeling diode, single phase half-controlled rectifier, single phase cycloconverter		
Unit:3	Three Phase Line Commutated Converters	7 Hours
Three phase three pulse converter, three phase bridge converter, speed control of DC motors (with single phase rectifier).		
Unit:4	Forced Commutated Semiconductor Devices and Protection	8 Hours
Characteristic and working of MOSFET, Gate turn off thyristor (GTO) and insulated gate bipolar transistor (IGBT) protection of SCR: gate circuit protection, over voltage and over current protection, snubber circuit design.		
Unit:5	D.C. Choppers	7 Hours
Principles of step-down chopper, step up chopper classification, Control strategies, time ratio control and current limit control. Voltage and load commutated choppers, Multiphase choppers, Application of choppers in speed control of DC Motor		
Unit 6	Single Phase and Three Phase Bridge Inverters	8 Hours
Single phase and three phase bridge inverters, Output voltage control, Harmonics in output voltage waveforms, Harmonic attenuation by filters, Harmonic reduction by pulse width modulation techniques, analysis of single pulse width modulation, working of current source inverters, applications.		
Total Lecture Hours		45 Hours

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Text books:

		ON	OR	CATION
1	Power Electronics Circuit Devices and Applications	3rd Edition, 2004	M. H. Rashid	Prentice Hall Limited
2	Power Electronics		D. Y. Shingare	Electrotech Publication Engineering Series

Reference books:

S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Power Electronics	1981	C. W. Lander	McGraw Hill
2	Thyristors Applications	2nd Edition 2002	Dr. M. Ramamoorthy	East West Press
3	Thyristors and Their Applications	4th edition	Dr. G. K. Dubey, Doraldia Sinha and Joshi	New Age International
4	Power Electronics	1989	Ned Mohan, T. M. Undeland, and W. P. Robbins	John Wiley and Sons

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2	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20Electronics/Power%20Electronics%20by%20Ps%20bimbhra.pdf

MOOCs Links and additional reading, learning, video material

1	https://youtu.be/B-I5bQDQLU?feature=shared
2	https://youtu.be/m-uY4fja_Jw?feature=shared

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V SEMESTER

23EL1504: Lab: Power Electronics

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Trace the static and dynamic characteristics of power semiconductor devices
2. Analyze the performance parameter of rectifier and cycloconverter
3. Calculate the performance parameter of buck/boost converter
4. Evaluate the performance parameter of DC/AC inverters

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	To plot V-I characteristics of SCR and measurement of holding and latching current of SCR.
2	To Perform Four modes operation of TRIAC
3	Analysis of Buck – Boost DC/DC converter
4	Study and analysis of single-phase half / full wave rectifier with Resistive load.
5	To plot Transfer and output characteristics of Power MOSFET.
6	Speed control of DC Shunt Motor with Semi Converter.
7	Performance analysis of single-phase step down Cycloconverter with Resistive load.
8	Study different Forced Commutation methods of SCR.
9	Study and analysis of single phase MOSFET based full Bridge inverter.

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23EL-101**

V SEMESTER

23EL1505: Fundamentals of Power System

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Describe basic components of Power System and per unit values of system components
2. Determine the transmission line parameters.
3. Explain the types of insulators, underground cables and the performance of system.
4. Evaluate the performance of distribution and transmission system.

Unit:1	Introduction to Power system	7 Hours
Structure of Electrical Power System, use of high voltage, idea about substation, classification, Indoor - outdoor substation, symbols for equipment used in substation, Per unit system: Representation of power system elements, models and parameters of generator, transformer and transmission lines		
Unit:2	Inductance of Transmission Line	8 Hours
Constants of transmission line, flux linkages, inductance of single-phase two-wire line, inductance of 3-phase overhead line, Symmetrical and unsymmetrical spacing, self-GMD and mutual GMD,		
Unit:3	Capacitance of Transmission Line	7 Hours
Electric Potential, Capacitance of single phase 2 wire line, capacitance of 3 phase overhead line, Symmetrical and unsymmetrical spacing		
Unit:4	Distribution system and Load flow analysis	8 Hours
Types of distribution systems, comparison, Feeders and distributors, DC and AC distribution, Y_{Bus} formation, Introduction to load flow studies.		
Unit:5	Insulators and Cables	7 Hours
Types, Potential distribution over suspension insulator string, String efficiency, Cables: Construction, classification, insulation resistance, capacitance, Dielectric stress, economical size, Grading of cables		
Unit :6	Transmission Systems	8 Hours
Short, medium (Nominal T and Nominal π method) and Long line, Voltage regulation & efficiency of power transmission lines, ABCD parameters of transmission lines.		
Total Lecture Hours		45 Hours

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23EL-101**

V SEMESTER

23EL1505: Fundamentals of Power System

Text books

1	V. K. Mehta, Rohit Mehta, Principles of Power System, First Multicolour edition S. Chand Publication, (Reprint 2015)
2	Ashfaq Hussain, Electric Power System, 5th edition, CBS Publication
3	I. J. Nagrath and D. P. Kothari, Modern Power System Analysis, 3rd edition, Tata McGraw Hill

Reference Books

1	W. D. Stevenson, Elements of Power system analysis, 4th edition, MGH Publication.
2	C. L. Wadhwa, Electrical Power system, 3rd edition, New Age International Publication.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://link.springer.com/openurl?genre=book&isbn=978-3-642-17988-4
2	http://link.springer.com/openurl?genre=book&isbn=978-3-642-04281-2

MOOCs Links and additional reading, learning, video material

1	https://youtu.be/dhmYOIBcwOU (Prof A. K. Sinha, IIT Kharagpur)
2	https://youtu.be/VoeiDVLAmgc (Dr. Ganesh Kumbhar, IIT Roorkee)
3	https://youtu.be/uy9lZCdkQIM (Dr. D. P. Kothari, IIT Delhi)

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SoE No.
23EL-101

V SEMESTER

23EL1506: Lab: Power System

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Review the fundamentals of the simulation environment specific to the power system
2. Estimate the performance of AC and DC distribution systems
3. Analyse various effects occurring on transmission lines and evaluate the performance of components connected in transmission lines
4. Deduce the performance parameters of transmission lines based on the length of the line

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	Design and Analysis of a Capacitor for the Improvement of Power Factor
2	Analysis and verification of the Ferranti Effect of Transmission Line
3	Evaluate the efficiency of the string of insulators
4	Estimate the point of minimum potential of the DC distributor fed at both ends
5	Estimate the sending end voltage of the AC distributor fed at one end
6	Design and Analyse the performance of short Transmission Line
7	Design and Examine ABCD parameters of the "Pi" model Medium Transmission Line
8	Design and Analyse the performance of "T" model Medium Transmission Line

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**SoE No.
23EL-101**

V Semester

23EL1507 : Internship ,Seminar and Report

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Demonstrate internship project and handle the practical situations on site.
2. Develop technical skills to address industry problems
3. Apply the theoretical knowledge in practical situation to realize industry problems
4. Summarize a detailed internship report.

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**SoE No.
23EL-101**

V Semester

23EL1521 : PE-I: Electric and Magnetic Field

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Explain the fundamentals of vector analysis and apply different coordinate systems (Cartesian, cylindrical, spherical) for electromagnetic field problems.
2. Apply Coulomb's Law, Gauss's Law, and electric field equations to analyze charge distributions and calculate electric field intensities.
3. Analyze the behavior of conductors, dielectrics, and boundary conditions to determine capacitance and electric flux.
4. Determine magnetic field intensity, inductance, and force using Biot-Savart's Law, Ampere's Law, and magnetic materials properties.
5. Evaluate time-varying electromagnetic fields using Maxwell's equations and determine power flow using Poynting theorem.

Unit:1	Vector Analysis	7 Hours
Scalars and vectors, vector algebra, the Cartesian coordinate system, the scalar and vector field, the dot product, the cross product, Cylindrical coordinate system, Spherical coordinate system		
Unit:2	Coulomb's Law and Electric Field Intensity; Electric Flux Density, Gauss's Law, and Divergence	8 Hours
Coulomb's Law, electric field intensity, types of charge distributions, electric field due to line charge density, surface charge density, and volume charge density, streamlines and sketches of fields. Concept of electric flux, electric flux density, Gauss's Law, application of Gauss's Law to symmetrical charge distributions, application of Gauss's Law to differential volume element, divergence, Maxwell's first equation in electrostatics, the vector operator, and the Divergence theorem		
Unit:3	Energy and Potential; Conductors, Dielectrics, and Capacitance	7 Hours
Energy expended in moving a point charge in an electric field, potential difference and potential, the potential field of a point charge, line charge density and surface charge density, the potential field of a system of charges, potential gradient, the dipole, energy density in the electrostatic field, Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions, the method of images, semiconductors, the nature of dielectric materials, boundary conditions for perfect dielectric materials, capacitance, several capacitance examples.		
Unit:4	Poisson's and Laplace Equations	8 Hours
Poisson's and Laplace equations, Uniqueness theorem, examples of the solution of Laplace equation (involving one variable only).		
Unit:5	Steady Magnetic Field; Magnetic Forces, Materials, and Inductance	7 Hours
Biot – Savart law, magnetic field due to infinitely long current filament, finite length current filament, Amperes circuital law, magnetic field due to coaxial cable, uniform sheet of surface current, solenoid, toroid, curl and its physical interpretation, Stokes theorem, magnetic flux and magnetic flux density, scalar and vector magnetic potentials, Force on a moving charge, force on a differential current element,		

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V Semester

23EL1521 : PE-I: Electric and Magnetic Field

force between differential current elements, force and torque on a closed circuit, nature of magnetic materials, magnetization and permeability, magnetic boundary conditions, potential energy and forces on magnetic materials, inductance and mutual inductance.

Unit :6	Time-Varying Fields and Maxwell's Equations, Uniform Plane Wave	8 Hours
Faraday's Law, derivation of Maxwell's equations in point form and integral form, displacement current and its physical interpretation, concept of retarded potentials, Maxwell's equations in phasor form, wave equations, uniform plane waves, solution of wave equation in free space, perfect dielectric, loss dielectrics and good conductor, skin effect and skin depth, Poynting vector.		
Total Lecture Hours		45 Hours

Text Books:

SN	Title	Edition	Authors	Publisher
1	Engineering Electromagnetics	7 th	W.H. Hayt J. A. Buck	McGraw Hill Publication.
2	Schaum's Outline Series Theory and Problems of Electromagnetics	2 nd	Joseph A. Edminister	Schaum's Outline Series of Engineering
3	Principles of Electromagnetics	4 th	Matthew N.O.Sadiku	Oxford University Press

Reference Books

SN	Title	Publication	Authors	Publisher
1	Applied Electromagnetic	1978	Plonus M. A.	MGH
2	Electromagnetics	1998	Kraus J. D.	MGH
3	Fundamentals of Electromagnetics with MATLAB	2 nd Edition	Karl E. Lonngren, Sava V. Savov, Randy J. Jost	Scitech Publishing Inc.

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1	https://youtu.be/pGdr9WLto4A
2	https://youtu.be/0A45kt2U3U8
3	https://youtu.be/whv_d-fBCg0
4	https://youtu.be/whv_d-fBCg0

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**SoE No.
23EL-101**

V Semester

23EL1522 : PE-I: Electrical Machine Design

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Classify various materials used in the construction of electrical machines and find their rating and performance
2. Determine the design parameters of the transformer
3. Compute stator, rotor design dimensions of induction motor
4. Evaluate the designed parameters of synchronous machine.

Unit:1	Review of material used in construction of electrical machines	7 Hours
Magnetic material such as amorphous, ferrite etc. Classification of insulating materials depending upon permissible temperature rise, properties of transformer oil, standard specifications, C.M.R. and short time of machines, Heating and cooling characteristics		
Unit:2	Transformer design : Main Dimensions	8 Hours
Output equation, equation for voltage per turn for power and distribution transformer, core design, overall dimensions of single phase and three phase transformer		
Unit:3	Transformer design : Performance Characteristics	7 Hours
Resistance and leakage reactance of winding for concentric cylindrical and sandwich type winding, estimation of no load current, method of cooling and cooling tank design.		
Unit:4	Induction motors: Stator Design	8 Hours
Total loading, specific loading on the machine, output equation, main dimension, estimation of axial lengths and air gap diameter based on different design criterion, estimation of number of slots, area of slot, stator teeth and stator core dimensions, length of mean turn, stator winding.		
Unit:5	Induction motor rotor design	7 Hours
Air gap length, no. of rotor slots, cage rotor and wound rotor, Design of rotor bar and slots, design of end ring, design of wound rotor, rotor teeth and rotor core design, Calculation of no load current, stator and rotor resistance and other performance characteristics for design data.		
Unit:6	Synchronous machines	8 Hours
Types of synchronous machines, Output equation, specific loadings, Design of salient pole (Main dimensions, length of air gap, shape of pole face, armature design) and turbo alternators (Main dimensions, length of air gap, stator and rotor design), Effect of SCR on machine performance, ventilation of synchronous generator, cooling circuit design, Hydrogen and water as cooling media		
Total Lecture Hours		45 Hours

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V Semester

23EL1522: PE-I: Electrical Machine Design

Text Books

S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Performance and Design of A.C. Machine	1995	M.G. Say.	English L B S
2	Electrical Machine Design	2016	A.K. Sawhney	Dhanpat Rai & Sons, Delhi

Reference books

S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Electrical Machine Design	3rd	Balbir Singh	Brite Student Publication, Pune
2	Power Transformers	2nd	S.B.VasuBinsky	
3	Principles of Electrical Machine Design	4th	R.K.Agrawal	S.K.Kataria

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1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Machines/Electrical%20Machinery%20by%20Dr.%20P%20S%20Bimbhra.pdf
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/fgKE6FWdLXU?feature=shared
2	https://youtu.be/fgKE6FWdLXU?feature=shared

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**SoE No.
23EL-101**

V SEMESTER

23EL1523: PE I: Design of Photovoltaic System

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Demonstrate the knowledge and apply key solar electric system concepts.
2. Select the Mounting, grounding, positioning, and installing the photovoltaic system.
3. Examine the performance, operation, and maintenance of the solar photovoltaic system.
4. Design of solar PV Plant with inclusion of costing and safety parameters.

Unit:1	Solar Photovoltaic Fundamentals	8 Hours
Introduction, PV cell characteristics and equivalent circuit, Model of PV cell, Short Circuit, Open circuit and peak power parameters, cell efficiency, Effect of temperature, Fill factor, Effect of clearness index.		
Unit:2	Solar Photovoltaic Module / Array	7 Hours
Connection of identical and non-identical PV cells in series and parallel circuits, Module in Series and Parallel, Load line, Estimation and Measurement of PV Module Power, Size Selection of PV Module		
Unit:3	Batteries	8 Hours
Fundamentals of batteries, Battery parameters, Selection of Battery, Series Parallel combination of Batteries, Energy and battery densities of batteries, Batteries for Photo voltaic System, Application of Batteries in Solar PV system, Battery Maintenance and Measurements, Battery Fault Detection and Test, Battery Installation for PV system.		
Unit:4	Charge Controller, MPPT and Inverter	7 Hours
Power MOSFET and IGBT, Opto coupler, Buck and Boost Converter, Fly back Converter, Full Bridge Inverter, Voltage and Current Feedback, DC to DC power converter, DC to AC Converter, AC to DC Converter, Battery Charge controller, Maximum Power Point Tracking, Specification of Inverter and charger.		
Unit:5	Solar PV System Design and Integration	8 Hours
Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of OFF grid Solar PV Power Plant, Design and Development of Solar Street Light and Solar Lantern, Off Grid Solar power Plant, Grid connected SPV,		
Unit :6	Installation, Costing, Trouble Shooting and Safety	7 Hours
Installation and Troubleshooting of Standalone Solar PV System, Maintenance of Solar PV System, Life cycle costing of SPV, Safety in installation of Solar PV System.		
Total Lecture Hours		45 Hours

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V SEMESTER

23EL1523: PE I: Design of Photovoltaic System

Text Books:

Sr	Title	Edition	Author	Publisher
1	Solar Photovoltaics: fundamentals, technologies and applications	2 nd	Chetan Singh Solanki	PHI Learning New Delhi, 2011
2	Photovoltaic Systems Engineering	2nd	Roger A Messenger and Jerry Ventre	CRC Press, Taylor & Francis Group, 2004.

Reference Books:

1.	Handbook of Photovoltaic Science and Engineering	1st	Antonio Luque, Steven Hegedus	John Wiley & Sons, 2011
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1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Renewable%20Energy%20Sources/B.H.Khan%20Book%20RES.pdf
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/hr2sId412zU?feature=shared
2	https://youtu.be/XYbdPiplbp8?feature=shared
3	https://youtu.be/zQbPzKU4gW8?feature=shared

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V SEMESTER

23EL1524: PE I: Electric Power Utilization

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Describe various types of heating and welding methods.
2. Calculate number of lamps required for Illumination.
3. Discuss different refrigeration and Air Conditioning systems for various application
4. Explain various types of fans, pumps, compressor and DG sets along with their application and their performance.

Unit:1	Electric Heating	7 Hours
Introduction, Advantages of electric heating, modes of heat transfer, methods of electric heating, resistance heating, arc heating, arc furnaces, induction heating, dielectric heating, infrared and radiant heating.		
Unit:2	Electric Welding	8 Hours
Definition, welding process, resistance electric welding, electric arc welding, submerged arc welding, MIG welding, Ultrasonic welding, laser beam welding, welding of various metals, underwater welding, defects in welding, testing of welding joints.		
Unit:3	Illumination	7 Hours
Nature of light, terms used in illumination, solid angle, laws of illumination, polar curves, Colour Rendering Index (CRI), types of lamps, luminaries, Design of illumination systems, indoor lighting systems, factory lighting, outdoor lighting design, flood lighting, street lighting, energy saving in lighting systems.		
Unit:4	Refrigeration & Air conditioning	8 Hours
Terminology, refrigeration cycle, refrigeration systems (Vapor compression, vapor absorption), domestic refrigerator, water cooler, desert cooler.		
Air conditioning: Factors involved in air conditioning, comfort air conditioning, industrial air conditioning, effective Temperature, summer/winter air conditioning systems, types of air conditioning systems, room air conditioning, and central air conditioning.		
Unit:5	Fans & Pumps	7 Hours
Fans and Blowers: Fan types, fan performance evaluation & efficient system operation, fan design & selection criteria, flow control strategies, fan performance assessment, energy saving opportunities.		
Pumps: Pump types, system characteristics. Pump curves, factors affecting pump performance, efficient pumping system operation, flow control strategies, energy conservation opportunities in pumping system.		

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V SEMESTER

23EL1524: PE I: Electric Power Utilization

Unit :6	Compressors and DG Sets	8 Hours
Compressors: Compressor types, Compressor efficiency, Compressed air system components. Diesel Generating Systems: Introduction, selection and installation factors, operational factors, energy performance assessment in DG sets, energy saving measures for DG sets.		
Total Lecture Hours		45 Hours

Text books:

S.N	Title	Edition	Author	Publisher
1	Utilization of Electric Energy	1 st Edition	E. Openshaw Taylor	Orient Longman
2	Utilization of Electric Power & Electric Traction	1 st Edition	J.B. Gupta	Kataria & Sons
3	Art and Science of Utilization of Electrical Energy	1 st Edition	H Partap	Dhanpat Rai & Sons, Delhi
4	Utilization of Electrical power	1 st Edition, 2006	R. K. Rajput	Laxmi Publications Pvt. Ltd.

Reference books:

S.No	Title	Edition	Author	Publisher
1	Guidebook for National Certification Examination for Energy Managers and Energy Auditors	BEEE	BEEE	Bureau of Energy Efficiency

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MOOCs Links and additional reading, learning, video material

1	https://www.google.com/search?q=NPTEL+on+Electric+power+utilization&rlz=1C1OKWM_enIN974IN974&oq=NPTEL+on+Electric+power+utilization&aqs=chrome..69i57j33i160l2.16754j0j15&sourceid=chrome&ie=UTF-8#
2	https://youtu.be/fQrZMMWolmA

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**SoE No.
23EL-101**

V SEMESTER

23EL1525: PE I: Applications of Renewable Energy Sources

Course Outcomes:

Upon successful completion of the course the students will be able to

- 1) Explain the concepts of solar radiation and its measurement using appropriate models and techniques.
- 2) Analyze the performance of various solar energy collectors and storage systems..
- 3) Apply solar energy systems for different practical applications such as heating, cooling, and power generation
- 4) Evaluate wind energy systems in terms of site selection, components, and grid integration.
- 5) Describe and compare ocean, tidal, wave, biogas, geothermal, and MHD energy systems and their operating principles.

Unit:1	Solar radiation & its Measurement	7 Hours
Solar constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surfaces.		
Unit:2	Solar Energy Collectors	8 Hours
Physical principles of the conversion of solar radiation into heat, flat plate collectors, transmissivity of cover systems, energy balance equation and collector efficiency, concentrating collectors, comparison of concentrating and flat plate collectors, selective absorber coatings. Solar energy storage systems (Thermal, Electrical, Chemical, Mechanical), Solar ponds.		
Unit:3	Applications of Solar Energy	7 Hours
Solar water heating, space heating, space cooling, solar thermal heat conversion, photovoltaic solar energy conversion, solar pumping, solar cooking.		
Unit:4	Wind Energy	8 Hours
Basic principles of wind energy conversion, wind energy conversion, wind data and energy estimation, site selection considerations, basic components of wind energy conversion systems (WECS), classification of WEC systems, generating system, energy storage, application of wind energy. Grid connection of Wind Power.		
Unit:5	Ocean and Tides	7 Hours
Energy from oceans :- Ocean thermal electric conversion (OTEC), Claud& Anderson cycles, evaporators, Bio-fouling, hybrid cycle. Energy from tides :- Introduction, basic principles of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of energy & power in simple single basin tidal system, advantages and limitations of tidal power generations, energy & power from waves, wave energy conversion devices, small scale hydro electric power generation.		

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Unit :6	Biogas, Geothermal and MHD	8 Hours
Other non-conventional energy sources (brief introduction to operating principles only) – Energy from bio-mass, geothermal energy		
Total Lecture Hours		45 Hours

Text books:				
S.N	Title	Edition	Author	Publisher
1	Solar Energy: Principles of Thermal collection and storage	1994	S. P. Sukhatme and J. K. Nayak	Tata-McGraw Hill Publishing Company Limited, New Delhi
2	Energy Technology : Nonconventional, Renewable and Conventional	2000	S. Rao and B.B. Parulekar	Khanna Publisher, New Delhi

Reference books:				
S.No	Title	Edition	Author	Publisher
1	Renewable Energy Sources Basic Principles and Applications	2015	G. N. Tiwari and M. K. Ghoshal	Narosa Publishing House, New Delhi.
2	Renewable and Efficient Electric Power Systems	2010	G. M. Masters	Wiley Interscience, New Jersey
3	Wind and Solar Power System	2013	M. R. Patel	CRC Press, New York.

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V SEMESTER

23EL1525: PE I: Applications of Renewable Energy Sources

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MOOCs Links and additional reading, learning, video material

- 1 https://www.google.com/search?q=NPTEL+on+Electric+power+utilization&rlz=1C1OKWM_enIN974IN974&oq=NPTEL+on+Electric+power+utilization&aqs=chrome..69i57j33i160l2.16754j0j15&sourceid=chrome&ie=UTF-8#

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**SoE No.
23EL-101**

V SEMESTER

23EL1526: PE I: Optimization Techniques

Upon successful completion of the course, the students will be able to

1. Classify various types of optimization problems and explain their real-world engineering applications.
2. Apply classical optimization techniques, including Lagrangian and Kuhn–Tucker conditions, to solve constrained and unconstrained optimization problems.
3. Develop and solve linear programming models using the Simplex method, Two-phase method, and Revised Simplex method.
4. Analyze duality theory and its implications in linear programming, including the use of the Dual Simplex method and Transportation problems.
5. Evaluate and implement modern and non-linear optimization techniques such as Genetic Algorithms and Particle Swarm Optimization for solving constrained problems

Unit:1	Introduction	8 Hours
Concept of optimization, Engineering applications of optimization, Statement of optimization problem, classification of optimization problems, optimization techniques		
Unit:2	Classical Optimization Techniques	7 Hours
Single variable optimizations, multivariable optimization with no constraints and equality & inequality constraints, solution using Lagrangian multipliers, Kuhn – Tucker Conditions		
Unit:3	Linear Programming – I (Simplex method)	8 Hours
Application of linear programming. Standard form & geometry of linear programming problems, definitions & theorems, solution of systems of linear simultaneous equations, simplex algorithm, Two-phase Simplex method		
Unit:4	Linear Programming – II	7 Hours
Revised Simplex method, Duality in Linear Programming, Primal Dual Relations, Duality Theorems, Dual Simplex Method, Decomposition Principle, Transportation Problems.		
Unit:5	Non – Linear Programming – One dimensional Minimization Methods	8 Hours
Brief Introduction, Characteristics of Non – linear programming techniques, Classification of Non – Linear Programming methods, Unimodal Function, Introduction to One dimensional, Non – linear optimization problems		

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Unit :6	Introduction to Modern Optimization Methods	7 Hours
Genetic Algorithm: Evolution in nature-Fundamentals of Evolutionary algorithms-Working Principles of Genetic Algorithm Selection, Crossover and Mutation, Reproduction, Genetic Operators Particle Swarm Optimization : Introduction, Computational Implementation of PSO, Improvement to the Particle Swarm Optimization Method , Solution of the Constrained Optimization Problem, Application of AI and ML.		
Total Lecture Hours		45 Hours

Text books:

S.N	Title	Edition	Author	Publisher
1	Engineering Optimization: Theory & practice	5 th Edition	S.S. Rao	John Wiley Publication
2	Modern optimization techniques with applications in Electric Power Systems	2012	Soliman Abdel Hady, Abdel Aal Hassan Mantawy	Springer Publications

Reference books:

S.N	Title	Edition	Author	Publisher
1	Operations Research: An Introduction	Eighth Edition	Taha, H.A	Prentice Hall of India
2	Engineering Optimization: Methods and Applications	Second Edition (Wiley India Edition)	A.Ravindran, K. M. Ragsdell, G. V. Reklaitis	John Wiley Publication
3	Power System Optimization	2nd Edition, 2010	D.P.Kothari and J.S.Dhillon	PHI learning private limited
4	Multi objective optimization using Evolutionary Algorithms	2008	Kalyanmoy Deb	John Wiley and Sons
5	Optimization for Engineering Design	First edition, 1988	Kalyanmoy Deb	Prentice hall of India

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

V SEMESTER

23EL1527: PE I: Thermal Power Plant Familiarization

Course Outcomes:

Upon successful completion of the course, the students will be able to

- 1) Understand the working principles and layout of a thermal power plant.
- 2) Describe the function and types of boilers, combustion systems, and fuel handling systems.
- 3) Analyse the operation of turbines, condensers, and power generation units.
- 4) Identify and explain the role of auxiliary systems and plant instrumentation.
- 5) Evaluate safety, environmental, and modern advancements in thermal power generation.

Unit:1	Introduction to Thermal Power Plants	8 Hours
Overview of global and Indian energy scenario, Classification of power plants, Rankin cycle and its modifications, Site selection for thermal power plants, General layout and flow diagram of a coal-based thermal power station.		
Unit:2	Boilers and Combustion Systems	7 Hours
Types of boilers: Fire-tube and Water-tube, Subsystems: Economizer, Super-heater, Re-heater, Air preheater, and Combustion of coal: Pulverized coal firing, Stokers, Draught system: Natural, Mechanical, Balanced Fuel handling systems and coal pulverisers, cold start-up, and hot shut-down. Basic control loops for combustion optimization.		
Unit:3	Steam Turbines and Generators	8 Hours
Types of steam turbines: Impulse and Reaction, Governing of turbines, Condensers and cooling systems, Direct coupling with alternators, Excitation systems and generator cooling		
Unit:4	Auxiliary and Support Systems	7 Hours
Ash handling systems: Wet and dry, Feed water and condensate systems, Circulating water system and cooling towers, Draft and flue gas system, Water treatment and demineralization plant.		
Unit:5	Instrumentation, Control, and Automation	8 Hours
Overview of control room operations, Distributed control systems (DCS) and SCADA, Temperature, pressure, and flow measurement, Interlocks and protections, Efficiency monitoring and performance indicators		
Unit :6	Safety, Environmental Aspects, and Modern Developments	7 Hours
Environmental impacts: Emissions, effluents, noise, ESP, scrubbers, and bag filters, Safety protocols, fire protection, and emergency response, Flue Gas Desulfurization (FGD), Modern trends: Supercritical and Ultra-supercritical plants, carbon capture		
Total Lecture Hours		45 Hours

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V SEMESTER

23EL1527: PE I: Thermal Power Plant Familiarization

Textbooks

1. P.K. Nag, Power Plant Engineering, 4th Edition, McGraw Hill Education, 2017,
2. Arora and Domkundwar, A Course in Power Plant Engineering, Revised Edition, Dhanpat Rai & Co., 2013
3. R.K. Rajput, Thermal Engineering, 10th Edition, Laxmi Publications, 2020,

Reference Books

1. M.M. El-Wakil, Power Plant Technology, 1st Edition, McGraw Hill, 1984
2. R. Yadav, Steam and Gas Turbines, 5th Edition, Central Publishing House, 2010
3. R.H. Perry and D.W. Green, Perry's Chemical Engineers' Handbook, 8th Edition, McGraw Hill, 2007

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23EL-101**

V SEMESTER

23EL1541: PE-II: Illumination Engineering (MOOC)

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Identify the criteria for the selection of lamps and lighting systems for an indoor or outdoor space
2. Explain the different parameters in designing an illumination system for a particular application.
3. Apply different illumination systems for different applications.
4. Devise proper illumination model for a specific application.
5. Justify the selection of proper illumination level and system for specific application.

Unit:1		7 Hours
Radiation & Colour , Eye & Vision , Different entities of illuminating systems		
Unit:2		8 Hours
Light sources: daylight, incandescent, electric discharge, fluorescent, arc lamps and lasers Luminaries, wiring, switching & control circuits		
Unit:3		7 Hours
Laws of illumination; illumination from point, line and surface sources, Photometry and spectrophotometry; photocells, Environment and glare		
Unit:4		8 Hours
General illumination design Interior lighting – industrial, residential, office, departmental stores, indoor stadium, theatre and hospitals		
Unit:5		7 Hours
Exterior lighting- flood, street, aviation and transport lighting, lighting for displays and signalling- neon signs, LED-LCD displays beacons and lighting for surveillance Utility services for large building/office complex & layout of different meters and protection units		
Unit :6		8 Hours
Different type of loads and their individual protections. Selection of cable/wire sizes, potential sources of fire hazards and precautions. Emergency supply standby & UPS. A specific design problem on this aspect		
Total Lecture Hours		45 Hours

MOOCs Links and additional reading, learning, video material

https://youtu.be/kAmb5cut_VA?feature=shared

<https://youtu.be/dQUvbbItNtU?feature=shared>

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V SEMESTER

23EL1543: PEII: Sensors and Actuators

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Classify control systems, the transfer function of the system with electrical and Mechanical systems
2. Illustrate the time response of the system
3. Analyze stability using the transfer function and state variable approach.
4. Estimate parameters using root locus and frequency domain methods.

Unit No.	Contents
1	Basics of Energy Transformation: Transducers, Sensors and Actuators, Understanding of thin film physics: Application in MOSFET and its variants
2	Thin Film Deposition Techniques: Chemical Vapor Deposition (APCVD, LPCVD, UHVCVD, PECVD, ALCVD, HPCVD, MOCVD), Thin Film Deposition Techniques: Physical Vapor Deposition (Thermal Deposition, E-beam Evaporation, Sputtering, Pulsed Laser Deposition)
3	Basics understanding of Photolithography for patterning layer. Detailed overview of Etching methods, Understanding various gas sensors: Optical gas sensor, Metal oxide semiconductor gas sensor, Field effect transistor gas sensor, Piezoelectric gas sensor, Polymer gas sensor, Nano-structured based gas sensors
4	Design and fabrication process of Microsensors: Force Sensors, Pressure Sensors, Strain gauges and practical applications, explain working principles of Actuators. Piezoelectric and Piezoresistive actuators, micropumps and micro actuators with practical applications
5	Understanding basics of microfluidics to assist Photomask design using Clewin Software, pattern transfer techniques, PDMS moulding and degassing, device bonding techniques, Simulation, Optimization and characterization of various sensors using COMSOL Multiphysics
6	Understanding of Sensor Interfacing with Microprocessor to build electronic system, Static and Dynamic Characteristic Parameters for Sensors and Actuators, Calibration of Sensor based electronics systems.

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23EL1543: PEII: Sensors and Actuators

Textbooks:

SN	Title	Year	Author	Publication
1	Sensors and Signal Conditioning : Handbook of modern sensors	2008	Jacob Fraden, Stefan Johann Rupitsch	Wiley-Blackwell Springer
2	Piezoelectric Sensors and Actuators: Fundamentals and Applications	2018	Senturia S. D.	Springer

Reference Books:

1	Microsystem Design	2001	J.D. Plummer, M.D. Deal, P.G. Griffin	Kluwer Academic Publisher
2	Silicon VLSI Technology	1998	S.M. Sze	Pearson Education
3	VLSI Technology	1998	Madou	McGraw Hill

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V SEMESTER

23EL1544: PEII: Distributed Generations in Power System

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Classify the energy sources and its conversion for distributed energy generation
2. Distinguish Solar Photovoltaic, wind turbine systems and other renewable energy sources
3. Use of fundamental knowledge of energy storage devices in power system
4. Evaluate the Performance of power system with respect to power quality

Unit:1	Introduction to Distributed Generation Systems	7 Hours
Introduction - Advantages of DG systems system Energy sources, Functions of power electronics interface, Solar Energy for Distributed Generation, wind Energy for DG, fuel cell for DG, Anti-Islanding protection, Operating Conflicts, IEEE standard 11547-2003, Applications of DG systems		
Unit:2	Solar and Wind Energy	8 Hours
Solar photovoltaic (PV) systems –Photovoltaic solar energy conversion:- Introduction, Equivalent Structure of PV cell, Series – Parallel combination, Partial shading, Introduction to DC – DC converter, solar MPPT, Solar PV systems, Grid converters and control Wind energy conversion systems (WECS) Basic components of wind energy conversion systems(WECS), Classification of WEC systems Application of wind energy, On – land and off – shore applications, Stand alone and Grid Connected Applications, types of wind turbines, Introduction to soft starters, Reduced and full capacity converters and wind MPPT, Introduction to control mechanism		
Unit:3	Hydro power station	7 Hours
Small-scale hydroelectric power generation, Schematic arrangement of Hydroelectric Power Station, Constituents of Hydroelectric power plant, Advantages and Limitations of Hydro-electric Plants, Hydrology, stream flow, flow duration curve, power duration curve, mass curve, reservoir capacity		
Unit:4	Energy storage devices	8 Hours
Introduction, Necessity of energy storage, specifications of energy storage, energy storage methods: mechanical, Electrochemical, chemical energy, electromagnetic, electrostatic, thermal energy storage		
Unit:5	Energy management system	7 Hours
Load Curves-Load forecasting, Load Shaping Objectives Methodologies - Peak load shaving - Energy management-Role of technology in demand response- Demand Side Management – Numerical Problems		

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Unit :6	Power Quality of Smart grid	8 Hours
Power quality: Introduction - Types of power quality disturbances - Voltage sag (or dip), transients, short duration voltage variation, Long duration voltage variation, voltage imbalance, waveform distortion, and voltage flicker - Harmonic sources: SMPS arcing devices, saturable devices, fluorescent lamps, harmonic indices (THD, TIF, DIN, C – message weights) Power quality aspects with smart grids.		
Total Lecture Hours		45 Hours

Text Books				
1	Generation of Electrical Energy	2014	By B.R.Gupta	S.Chand
2	Non conventional energy sources	2017	B.H.Khan	Mc Graw Hill
3	Essentials of Distributed Generation System	2009	Massey	Jones & Bartlett Learning
Reference books				
1	Distributed Systems : Concept And Design-	2017	Coulouris George, Dollimore Jean, Kindberg Tim	PEARSON
2	Power Quality in Microgrids Based on Distributed Generators	2019	Ambrish Chandra and Hua Geng	MDPI AG publisher

YCCE e-library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Renewable%20Energy%20Sources/
MOOCs Links and additional reading, learning, and video material	
1	https://youtu.be/ui5zOmAX3cc
2	https://youtu.be/DlGSGJISxUI

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V SEMESTER

23EL1545: PEII: 8085 Programming

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Explain types of memory devices and architecture of 8085 microprocessor.
2. Classify the instructions with the help of Addressing modes of 8085 with necessary programs.
3. Apply the knowledge of programming concepts of 8085 for various applications.
4. Analyze the architecture of various Interfacing Devices like 8255 PPI, 8253, ADC and DAC and Programming of all the Interfacing IC's.

Unit:1	Memory devices	7 Hours
Memory devices, RAM, ROM, Introduction to Intel's 8085 Architecture, Flag register, Instruction set, Addressing modes, assemblers, hand coding		
Unit:2	Programming Instructions	8 Hours
Branching instruction, Simple programmes, stack, PUSH, POP Instructions, CALL/RETURN instruction & Subroutines- simple & nested programmes, Programmes using Subroutines.		
Unit:3	Timing Diagrams	7 Hours
Timing Diagrams, Timing Diagram of instruction. Delay programmes, Serial data transfer, Interrupts - concept and structure in 8085 Interrupt service routine, advanced instructions & Programming of 8085A		
Unit:4	Interfacing of Microprocessor	8 Hours
Complete signal description of 8085, interfacing memory devices interfacing I/O devices. Methods of data transfer- serial, parallel synchronous and asynchronous. IN/OUT instructions. Hardware considerations bus contention, slow memory interfacing		
Unit:5	Hardware interfacing and Handshaking	7 Hours
Simple hardware interface to 8085 of standard latches & buffers as I/O ports. Architecture and interface of 8255 & 8085. Handshaking concepts. Interfacing of multiplexed keyboard/ display interface and assembler directives. Interfacing of ADC & DAC, stepper motor Interface with 8085		
Unit :6	Architecture and Interface	8 Hours
Architecture and interface of 8253 with & 8085, Different modes of 8253. Architecture and interface of 8257 with & 8085, Different modes of operation of 8257, Application of microcontroller.		
Total Lecture Hours		45 Hours

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V SEMESTER

23EL1546 : PELL: Analog and Digital Electronics

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Understand the working principles and characteristics of diodes, BJTs, and operational amplifiers.
2. Analyze and design Op-Amp-based circuits including amplifiers, filters, oscillators, and waveform generators.
3. Apply Boolean algebra and K-map simplification to design combinational digital circuits.
4. Design and implement sequential circuits using flip-flops, counters, and shift registers.
5. Interpret number systems, codes, and digital logic families to evaluate digital circuit performance.

Unit:1	Semiconductor Devices and Applications	8 Hours
Review of semiconductor basics – intrinsic and extrinsic semiconductors, doping, and charge carriers. PN junction diode: characteristics, diode equation, Zener diode, and applications (clipper, clamper). Bipolar Junction Transistor (BJT): Construction, operation (active, cutoff, saturation modes), Input-output characteristics, Biasing techniques (fixed, voltage divider), Small signal model and analysis, Applications of diodes and transistors in signal conditioning and switching.		
Unit:2	Operational Amplifiers and Linear Applications	7 Hours
Introduction to PSPICE, Operational Amplifier (Op-Amp) fundamentals: Ideal vs practical Op-Amp parameters, Inverting and non-inverting amplifiers, Summing, difference, integrator, and differentiator circuits Op-Amp applications: Voltage follower, comparator, Precision rectifier, Active filters: Low-pass and high-pass filters (first order) , Oscillators using Op-Amp: Wein Bridge oscillator, Phase shift oscillator,		
Unit:3	Logic Gates, Boolean Algebra, and Combinational Circuits Part 1	8 Hours
Number systems: Binary, Decimal, Octal, Hexadecimal, conversions Binary arithmetic: Addition, subtraction (1's and 2's complement) Codes: BCD, Gray, ASCII, Excess-3; Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR; truth tables		
Unit:4	Logic Gates, Boolean Algebra, and Combinational Circuits Part 2	7 Hours
Boolean algebra: Laws, DeMorgan's Theorems Simplification using Karnaugh Maps (K-maps) – 2, 3, 4-variable Combinational Circuits: Adders (Half, Full), Subtractors, Multiplexers (MUX), Demultiplexers (DEMUX), Encoders, Decoders, Comparators		
Unit:5	Sequential Logic Circuits-Part 1	8 Hours
Flip-Flops: SR, D, T, JK Flip-Flops, Truth tables and characteristic equations, Race-around condition, master-slave JK FF Registers: Serial-in Serial-out (SISO), Serial-in Parallel-out (SIPO), Parallel-in Serial-out (PISO), Parallel-in Parallel-out (PIPO)		
Unit :6	Sequential Logic Circuits-Part 2	7 Hours
Counters: Asynchronous (Ripple) counters, Synchronous counters, Up, Down, and Up/Down counters, Mod-N counters Applications of counters in digital clocks, frequency division		
Total Lecture Hours		45 Hours

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Text Books			
Title	Edition	Author	Publisher
Programming and Interfacing 8085	6th Edition	Gaonkar	Penram International Publishing
Programming of 8085	3rd Edition	D.V. Hall	McGraw-Hill Education
Reference books			
Microprocessor & Interfacing Manual, Intel Peripheral	8 th Edition	Barry Brey	Pearson

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23EL-101**

V SEMESTER

Mandatory Learning Course (Audit Course)

MLC2125 : YCAP5

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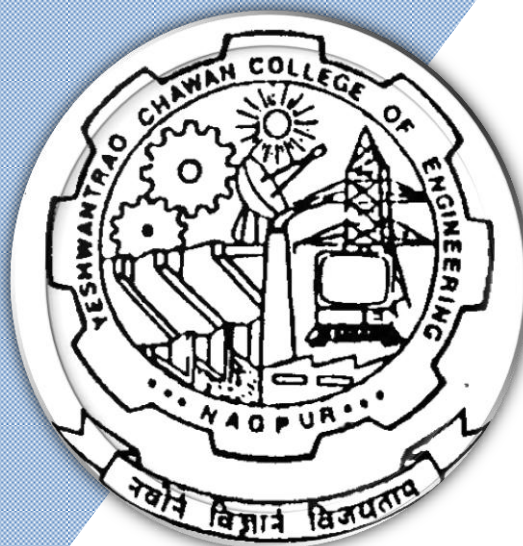
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Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

6th Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



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B.TECH SCHEME OF EXAMINATION 2023
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 (Department of Electrical Engineering)
B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
SIXTH SEMESTER																
1	6	PC	EL	23EL1601	Power System Analysis	T	3	0	0	3	3	30	20	50	3	
2	6	PC	EL	23EL1602	Fundamentals of Electrical Drives	T	3	0	0	3	3	30	20	50	3	
3	6	PC	EL	23EL1603	Lab : Fundamentals of Electrical Drives	P	0	0	2	2	1		60	40		
4	6	PC	EL	23EL1604	Lab : Electronics Engineering workshop	P	0	0	2	2	1		60	40		
5	6	PC	EL	23EL1605	Lab : Simulation in Power Electronics	P	0	0	2	2	1		60	40		
12	6	PC	EL	23EL1606	Design Thinking in Electrical Engineering & Research Methodology	T	2	0	0	2	2	30	20	50	3	
6	6	PE	EL		Professional Elective -III	T	2	0	0	2	3	30	20	50	3	
7	6	PE	EL		Lab : Professional Elective -III	P	0	0	2	2	1		60	40		
8	6	PE	EL		Professional Elective -IV	T	3	0	0	3	3	30	20	50	3	
9	6	MDM	EL		MD Minor Course-IV	T	3	0	0	3	3	30	20	50	3	
10	6	VSEC-4	EL	23EL1607	Lab.:Substation Design	P	0	0	2	4	2		60	40		
11	6	STR	EL	23EL1608	Project Phase -I	P	0	0	4	4	2		60	40		
TOTAL							16	0	14	32	25					

List of Mandatory Learning Course (MLC)

1	6	HS		MLC126	YCAP6 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Professional Electives-III

1	6	PE-III	EL	23EL1621	PE-III : Electrical Installation Design
2	6	PE-III	EL	23EL1622	PE-III : Lab : Electrical Installation Design
3	6	PE-III	EL	23EL1623	PE-III : Electrical Energy Audit and Safety Analysis
4	6	PE-III	EL	23EL1624	PE-III : Lab : Electrical Energy Audit and Safety Analysis
5	6	PE-III	EL	23EL1625	PE-III : Project Planning and Management
6	6	PE-III	EL	23EL1626	PE-III : Lab : Project Planning and Management
7	6	PE-III	EL	23EL1627	PE-III : Power Electronics Converters for Renewable Energy
8	6	PE-III	EL	23EL1628	PE-III : Lab : Power Electronics Converters for Renewable Energy
9	6	PE-III	EL	23EL1629	PE-III : Embedded System
10	6	PE-III	EL	23EL1630	PE-III : Lab : Embedded System
11	6	PE-III	EL	23EL1631	PE-III : PLC and Industrial Automation
12	6	PE-III	EL	23EL1632	PE-III : Lab : PLC and Industrial Automation

Professional Electives -IV

1	6	PE-IV	EL	23EL1641	PE-IV : Advanced Power Electronics
2	6	PE-IV	EL	23EL1642	PE-IV : Advanced Electrical Drives
3	6	PE-IV	EL	23EL1643	PE-IV : Grid Integration in Renewable Energy Systems
4	6	PE-IV	EL	23EL1644	PE-IV : Power System Operation and Management
5	6	PE-IV	EL	23EL1645	PE-IV : Microgrid
6	6	PE-IV	EL	23EL1646	PE-IV : Advanced Control System
7	6	PE-IV	EL	23EL1647	PE-IV : Environmental, Social, and Governance (ESG) frameworks in Industry 4.0

Coursera Elective

1	6	PE-IV	EL	23EL1648	PE-IV : Energy Production, Distribution and Safety
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23EL-101**

VI Semester

23EL1601: Power System Analysis

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Apply symmetrical components concepts in fault analysis
2. Analyse different faults in power system
3. Evaluate stability and economic operation of power system
4. Differentiate different neutral grounding and compensation systems

Unit:1	Symmetrical Fault Analysis	7 Hours
Define fault & its causes, effect of fault on power system, purpose of fault analysis, assumptions made for fault analysis, transient in a series R-L circuit, short circuit analysis on synchronous machine at no-load & loaded condition, selection of circuit breaker & its short circuit MVA calculation, current limiting reactors.		
Unit:2	Symmetrical Component	8 Hours
Introduction, α -operator, symmetrical components of an unbalanced Three phase system, symmetrical components of voltage & current phasors, zero sequence components of voltage & current, power in terms of symmetrical components, phase shift in star-delta transformers, sequence network for fault calculation, sequence impedances of transmission line & synchronous machines, zero sequence networks of transformers, assembly of sequence networks of power system.		
Unit:3	Unsymmetrical Fault Analysis	7 Hours
Assumptions made for unsymmetrical fault analysis, sequence voltages of a generator, sequence voltages at a fault point, general procedure for analysis of various fault with and without fault impedance for Line to Ground (L-G), L-L-G, L-L, Open conductors faults analysis using symmetrical components.		
Unit:4	Power System Stability	8 Hours
Stability of power system:-Steady state, Dynamic and Transient stability definition, Dynamics of synchronous machine, swing equation, swing equation for machines swinging coherently and Non-Coherently. Power angle equation, Steady state stability studies. Transient stability studies: - Swing curve, Equal Area criterion for transient stability, Application of equal area criterion for different disturbances. Solutions of swing equation by point by point method. Methods of improving transient stability.		
Unit:5	Economic operation of power system	7 Hours
Introduction, incremental fuel cost, economic dispatch neglecting transmission losses, transmission loss as a function of plant generation, general loss formula, and optimum load dispatch considering transmission losses		
Unit:6	System Neutral Grounding & Reactive Power Compensation	8 Hours
Neutral Grounding: - Introduction to neutral grounding, methods of neutral grounding, Peterson coil grounding. Compensation: - Series & shunt compensation, location of series capacitors, protective schemes for series capacitors, problem associated with series capacitors, Static VAR system with its different schemes.		
Total Lecture Hours		45 Hours

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Text books

- 1 Electrical Power System ,5th edition 2007 ,Ashfaq Hussain, CBS
- 2 Modern PowerSystem analysis , 4th-2011 ,I. J. Nagrath & D. P. Kothari ,Tata McGraw Hill

Reference Books

- 1 Elements of Power System Analysis,4th-1984,W. D. Stevenson,Tata McGraw Hill
- 2 Electrical Power System ,3rd – 2005 ,C. L. Wadhawa ,New Age International

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 [http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20System%20Engineering/Electrical%20Power%20Systems%20D.Das%20\(%20PDFDrive%20\).pdf](http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20System%20Engineering/Electrical%20Power%20Systems%20D.Das%20(%20PDFDrive%20).pdf)
- 2 [http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/POWER%20SYSTEM/modern-power-systems-analysis-d-p-kothari-i-j-nagrath\(2\).pdf](http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/POWER%20SYSTEM/modern-power-systems-analysis-d-p-kothari-i-j-nagrath(2).pdf)

MOOCs Links and additional reading, learning, video material

- 1 <https://youtu.be/I-kQjugkQAY?feature=shared>
- 2 https://youtu.be/fBm1dr_gRBk?feature=shared
- 3 <https://youtu.be/dhmYOIBcwOU?feature=shared>

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VI SEMESTER

23EL1602: Fundamentals of Electrical Drives

Course Outcomes

Upon successful completion of the course the students will be able to

1. Explain the fundamental concepts of electric drives and their classification, including speed-torque.
2. Select appropriate motors and bearings for various industrial applications.
3. Analyse and differentiate the operation of AC and DC contactors, limit switches, and related control components.
4. Develop and simulate basic PLC ladder logic programs and demonstrate their applications in controlling electrical drives.
5. Evaluate the characteristics, control methods, and braking techniques of AC/DC traction motors

Unit:1	Introduction to Drives and Speed Control	7 Hours
Definition of a Drive, Classification of Drives, Brief idea about drives commonly used in industries, Speed-torque characteristics of common drive motors (DC and AC), Characteristics of Drives under starting and running, Types of braking, Speed Control of AC and DC motors.		
Unit:2	Selection of motors	8 Hours
Selection of motors and bearings of motor: Power capacity for continuous and intermittent periodic duties, Flywheel effect, Duty cycles of motor, transmission, enclosure systems for drives.		
Unit:3	AC and DC contactor	7 Hours
Analyze ,Categorize AC- DC Contactor, limit switch, working, applications, Power and Control circuit by using contactors		
Unit:4	Programmable Logic Controllers	8 Hours
Programmable Logic Controllers (PLC), programming methods, Ladder programming with few examples, Applications of PLC's in electrical drives.		
Unit:5	Traction Drives	7 Hours
Traction motors: Motors used in AC/DC traction and their performance and desirable characteristics, requirements and suitability of motor for traction duty, speed-time characteristics of the train, Traction motor control. Series parallel control with numerical method, starting and braking of the traction motor		
Unit :6	Digital speed control of Electric motors	8 Hours
Digital speed control of Electric motors, comparison with Analog method of speed control, Block Diagram arrangement for microprocessor-based speed control of AC/DC motor, Flowcharts and algorithms for speed control and speed reversal of motor. Digital Signal Processors (DSPs) for drive control. Introduction to Variable Frequency Drive (VFD)		
Total Lecture Hours		45 Hours

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Text books

- | | |
|---|---|
| 1 | A Course in Electrical Power, 1 st - 2005, Soni, Gupta, Bhatnagar, Dhanpat Rai and Company Publication |
|---|---|

Reference Books

- | | |
|---|--|
| 1 | A Electrical Technology Volume III Transmission, Distribution, Utilization, B. L. Theraja, A. K. Theraja, 2 nd - 2005, S. Chand |
| 2 | Magnetic control of motors, Industrial New York 1947, Heumann, Chapman and Hall Publication |
| 3 | Modern utilization of traction motor, 2003, J.B. Gupta, Dhanpat Rai and Company Publication |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- | | |
|---|---|
| 1 | http://link.springer.com/openurl?genre=book&isbn=978-3-642-25904-3 |
|---|---|

MzOOCs Links and additional reading, learning, video material

- | | |
|---|---|
| 1 | https://youtu.be/JZ6f_i4ao6Y |
| 2 | https://youtu.be/1AT1yuQ9awM |
| 3 | https://youtu.be/zWvcM-4aUgg |

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VI SEMESTER

23EL1603: Lab: Fundamentals of Electrical Drives

Course Outcomes

Upon successful completion of the course the students will be able to

- 1: Evaluate and interpret the control circuits of Star-Delta and Direct-On-Line (DOL) starters
- 2: Categorize and differentiate between various types of AC and DC contactors & LIMIT switch based on their construction and application.
- 3: Design basic ladder logic programs in PLCs to control lamps and implement real-time control operations
- 4: Design and simulate a sequence control logic for multiple lamps using ladder diagrams in PLC.

Minimum Eight Practicals to be performed from the list below

Sr. No.	List of Experiments
1	To evaluate and explain the control circuit of star delta starter
2	To evaluate and explain control circuit of direct online starter (DOL)
3	To explain function of side rotary limit switch.
4	To categorize different types contactors
5	To classify and explain programming logic control (PLC) M-1200, M-1400 and LOGO PLC.
6	To make use of operating limit switch to turn ON contactor (output device)
7	To design ladder programming in PLC to control lamp
8	To design ladder programming using LOGO PLC to control lamp.
9	To explain Implementation of timer using LOGO PLC
10	To design ladder programming in PLC to Control of lamps in pre- defined sequence
11	To design a program for Reversal of synchronous motor using PLC
12	To make use of limit switch, and sensors to turn ON contactor motor, lamp

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VI SEMESTER

23EL1604: Lab: Electronics Engineering Workshop

Course Outcomes

Upon successful completion of the course the students will be able to

1. Explain the electrical characteristics and functions of Power Electronics components.
2. Apply PCB design principles to fabricate functional circuits.
3. Analyze and implement voltage regulators and timer circuits using Op-Amps, LEDs, and ICs.
4. Evaluate power diodes, transistors, and Op-Amps using systematic testing and measurement.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	Design and fabrication of PCB
2	Design of voltage regulators
3	Design of different timers using operational amplifiers.
4	Study and testing of diodes
5	Study and testing of transistor
6	Study and testing of MOSFET, IGBT
7	Study and testing of Thyristor, power diodes
8	Study and testing of power transistors
9	Study and testing of operational amplifiers, LEDs, ICs etc

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VI SEMESTER

23EL1605: Lab : Simulation in Power Electronics

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Demonstrate the fundamentals of the simulation environment of MATLAB/SIMULINK software
2. Describe MATLAB/SIMULINK as a tool to solve power system and power electronics problems
3. Develop simulation models in the power system and analyse the performance
4. Make use of SIMULINK to build and analyse models of power electronics

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	Analysis and Improvement of Power factor by using MATLAB Simulation
2	Simulation of Fortescue's Theorem
3	Analysis and verification of Ferranti Effect of Transmission Line by MATLAB Simulation.
4	Simulation of single-phase full wave fully controlled rectifier.
5	Examine the Performance of Buck DC -DC regulator with Matlab/Similink Simulation.
6	Study, analysis, and simulation of full bridge square wave inverter
7	Analysis, and Simulation of Full Bridge (Three - Level H –Bridge) with Sinusoidal Pulse Width Modulation (SPWM) Technique
8	Simulate and Evaluate the Performance of Five-Level Cascaded H- Bridge (CHB) inverter with Sinusoidal Pulse Width Modulation (SPWM) Technique

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VI SEMESTER

23EL1606: Design Thinking and Research Methodology

Course Outcomes:

Upon successful completion of the course the students will be able to

- 1) Comprehend the foundational concepts of research methodology
- 2) Identify and formulate research problems and conduct effective literature reviews and adhere to ethical research practices
- 3) Collect and analyze data using appropriate methods.
- 4) Interpret research findings and write scientific reports

Unit:1	Fundamentals of Design Thinking in Electrical Engineering	7 Hours
Introduction to Design Thinking: Definition and origins of design thinking in engineering contexts, Applications of design thinking in electrical engineering domains (power systems, electronics, control systems) Identifying problems in Electrical Engineering: Real-world Electrical Engineering problems such as voltage instability, power quality degradation, high energy consumption, equipment failure, and renewable integration challenges etc. Empathy Mapping for electrical stakeholders: Identifying stakeholders i.e. consumers, utility providers, maintenance personnel, regulatory body. Developing Empathy Maps using 5Ws+1H and interviews/observations to capture user perspectives. Framing user-centered challenges: Transforming observed problems into well-defined design challenges. Ideation Techniques: Brainstorming, Mind Mapping etc.		
Unit:2	Prototyping and Application in Electrical Engineering	8 Hours
Creating Prototypes: Development of prototypes for Electrical Engineering applications using breadboards, PCB design, hardware setups, or simulation. Simulation and Design Tools: MATLAB/Simulink Simulation, AutoCAD Electrical Design, Multisim. Case Study: Identification of relevant Electrical Engineering problems, Application of the Design Thinking process to develop a solution, Presentation of the solution through technical storytelling, demo or documentation.		
Unit:3	Research Fundamentals, Research Problem and Design, Literature Review	7 Hours
Research Fundamentals: Definition, objectives, and significance of research, Types of research: Basic, Applied, Descriptive, Analytical, Quantitative, and Qualitative. Research Problem and Design: Criteria of good research, Techniques for defining and identifying a		

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research problem, Features of good research problem/design, Necessity of defining the problem, Meaning of research design, Types of research design – Exploratory, Descriptive, Diagnostic, and Experimental
Literature Review: Importance and methods of conducting a literature review, Sources of information: Journals, conferences, patents, etc., Technical reading strategies.

Unit:4	Sampling and Data Collection, Data Analysis and Interpretation, Technical Writing, Research Ethics	8 Hours
Sampling and Data Collection: Sampling techniques: Probability and Non-probability sampling, Characteristics of a good sample, Sample size determination, Data types: Primary and Secondary, Methods of primary data collection: Observation, Interview, Questionnaire, Schedule, Secondary data sources Data Analysis and Interpretation: Processing and analyzing data, Statistical tools: Measures of central tendency, Dispersion, Correlation, Regression, Hypothesis testing: Null and alternative hypothesis, Type I and II errors, Use of software tools (e.g., Excel/SPSS/MATLAB for analysis), Interpretation of results Technical Writing, Research Ethics: Publication ethics and responsibilities of researchers, Structure and components of research report, Types of technical reports and papers, Writing thesis and dissertations, Referencing and citation styles (APA, IEEE, etc.), Ethical considerations in engineering research., Plagiarism and research ethics		
Total Lecture Hours		30 Hours

Text books

1	I. Cuiñas and M. J. Fernández Iglesias, Design Thinking for Engineering: A Practical Guide. London, U.K.: The Institution of Engineering and Technology (IET), 2023.
2	C. Diderich, Design Thinking for Strategy: Innovating Towards Competitive Advantage. Cham, Switzerland: Springer International Publishing, 2019.
3	C.R. Kothari – Research Methodology: Methods and Techniques, New Age International.
4	Ranjit Kumar – Research Methodology: A Step-by-Step Guide for Beginners, Sage Publications.

Reference Books

1	F. Darbellay, T. Lubart, and Z. Moody, Eds., Creativity, Design Thinking and
2	Interdisciplinarity. Singapore: Springer Nature Singapore.
3	S. R. Tiwari and R. R. Swarup, Design Thinking: A Comprehensive Textbook. New Delhi, India: Wiley India Pvt. Ltd.
	R. Panneerselvam – Research Methodology, PHI Learning.
	Dawson, C. – Practical Research Methods, UBS Publishers.
	Trochim, W.M.K. – Research Methods: The Concise Knowledge Base.

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VI SEMESTER

23EL1607: Lab: Sub-Station Design

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Explain single line diagram of substation with rating of different equipments, types of relays required and their settings.
2. Construct plan of equipment's and panels mounted in a substation
3. Analyze earthing system of substation.
4. Design of substation complete in regard to selection of equipment's, sizes, protective schemes and earthing system.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	Introduction to Substation design
2	Demonstrate various components of 11 k V YCCE main substation
3	Demonstrate Single line diagram of 11 kV YCCE substation-2(Near canteen)
4	Analysis of Protection scheme of 33 k V YCCE BabasahebKedar Sutgirni substation,Hingna Nagpur
5	Analysis of Earthing layout of 33 k V YCCE MSEDCL Isasani substation
6	132 k V MSETCL Hingna-1 substation
7	To study 220 k V Butibori-1 MSETCL substation
8	Single line diagram of proposed 132 k V YCCE Substation
9	Study of Control panel layout
10	Study of Substation earthing

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VI SEMESTER

23EL1621: PE-III : Electrical Installation Design

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Interpret key concepts of load forecasting and apply the Indian Electricity Rules (IER) to design domestic, commercial, and industrial electrical installations.
2. Select appropriate cables, wires, conductors, and insulators for various installations based on ratings, derating factors, and voltage drop calculations.
3. Design single line diagrams and layout plans for substations (11 kV to 33 kV).
4. Evaluate fault levels and select protective devices (relays, fuses, circuit breakers) and fire fighting requirements.
5. Perform testing of power transformers and access compliance with operational and safety standards before commissioning.

Unit:1	Introduction	7 Hours
Load forecasting, regression analysis, numerical based on linear and exponential trends, Electrical installation for domestic, commercial and industrial consumers, calculation of connected load, selection of transformers, switchgears, cables and wires, single line diagram, special provisions for high rise buildings (IER-50-A), earthing requirements, megger and earth tests, use of earth leakage circuit breakers (special reference to be given to IER 2 (i, n, o, p, v, aa, aaa, aq, aqq, ar, av)).		
Unit:2	Cables	8 Hours
Cables: PVC and XLPE cables, their construction in brief, current ratings, specifications, derating factors, Megger and continuity test. Overhead distribution lines upto 33 kV, Line apparatus and basic construction, clearances, selection of AAC and ACSR conductors, voltage drop calculations, Selection of Insulators, earthing requirements. (Special reference to be given to IER 77, 79, 80, 81, 87, 89, 90, 91, 92)		
Unit:3	Illumination	7 Hours
Definitions, polar curves, simple calculations, working principles of fluorescent, sodium vapour and mercury vapour lamps, Capacitors and power factor improvement: Determination of rating and location of capacitors, calculation of payback period for additional capacitors.		
Unit:4	Substation	8 Hours
Single line diagram, plan, elevation and clearances for 11 kV pole mounted, 11 kV plinth mounted (upto 1000 kVA and above 1000 kVA), 33 kV (upto 2500 kVA and above 2500 kVA) substations. Single line diagram for substation with two transformers in parallel, specifications of isolators, lightning arrestors, horn gap fuses, D.O. fuses, circuit breakers, instrument transformers, power transformers, LV HRC fuses, LV circuit breakers, (Special reference to be given to IER 31, 33, 35, 43, 44, 47, 48, 50, 51, 54, 58, 64, 64A, 67 and IS3043)		

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Unit:5	Protection	7 Hours
Determination of fault levels of various locations in substation, use of current limiting reactors, philosophy of protective relaying, over current, earth fault, REF protection, earth leakage protection, OTI, WTI, Buchholz relays, Firefighting equipments, restoration of a person affected by electric shock, Earthing: types, measurement of earth resistance		
Unit:6	Testing of transformer	8 Hours
Site testing of transformer (Visual, pre-commissioning tests like megger, magnetic balance, turns ratio), testing of oil, operational test for Buchholz, OTI, WTI, alarm and trip functions.		
Total Lecture Hours		45 Hours

Text books	
1	Electric Power, 2016, Soni, Gupta, Bhatnagar, Dhanpat Rai Publication
2	Electrical Installation Design, 2012, Jain, Bajaj, Laxmi Publication
3	Power Electronics and AC Drives, 2003, B.K. Bose, Pearson Education
Reference Books	
1	Electric Power Distribution Systems, 2004, Pabla, McGraw Hill
2	Electrical Substation, S.Rao, Khanna Publication
3	Electrical Engineering handbook, 2018, C.L.Wadhwa, New Age International
4	IER (latest edition)
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Installation/Electrical%20Installation%20Calculations%20Fourth%20Edition%20by%20Mark%20Coates%20and%20Brian%20Jenkins.pdf
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/vp5lAPbq0QU?feature=shared

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VI SEMESTER

23EL1622: PE-III : Lab: Electrical Installation Design

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	Identification of different parts of 4-Core cable and to conduct continuity test.
2	To design Godown wiring using lamps ,controlled switches.
3	Plot and Analyze the Characteristics of Fuse Wire.
4	Demonstrate Wiring and Operation of a Fluorescent Lamp Circuit.
5	Describe and Compare Different Types of Earthing Systems as per IEC Standards.
6	To measure Insulation resistance by Megger.
7	Design of Substation Layout for 11 kV and 33 kV Ratings.
8	Classify and Compare Different Types of Electrical Insulators.
9	Analyze and Interpret Tariff Structures Including TOD Tariff.
10	Plot and Analyze the Characteristics of Fuse Wire.
11	Calculate and Verify the Turns Ratio of a Single Phase Transformer.
12	Analyze and Interpret Tariff Structures Including TOD Tariff.

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VI SEMESTER

23EL1623:PE-III : Electrical Energy Audit and Safety Analysis

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Explain, the energy sources, methods of energy conservation and its pattern, electricity act 2003
2. Interpret different forms of electrical and thermal energy
3. Examine the Energy Management, Energy Audit, Energy Monitoring and Targeting
4. Determine the performance evaluation of Electric motors and drives and testing procedure, co-generation system and Electrical safety procedures

Unit:1	Energy Scenario	7 Hours
Commercial and Non-commercial energy, primary energy sources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance. Re-structuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features, Salient Features of Electricity Act 2003.		
Unit:2	Basics of Energy and its various forms	8 Hours
Electricity basics- DC & AC currents, electricity tariff, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion		
Unit:3	Energy Management & Audit	7 Hours
Definition, need and types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments.		
Unit:4	Energy Monitoring and Targeting	8 Hours
Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques - energy consumption, production, cumulative sum of differences (CUSUM).		
Unit:5	Performance Evaluation of Electric Motor and variable Speed Drives	7 Hours
Methods for determining motor loading, methods of determining motor efficiency, evaluating performance of rewind motors, variable speed drive: principles and applications, factors for successful implementation of variable speed drive		
Unit:6	Captive and Cogeneration Systems	Hours
Introduction, purpose of the performance test, performance terms and definitions, reference standards, field testing procedure, examples, Case study of bottoming cogeneration in industries.		
Total Lecture Hours		45 Hours

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S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Principles of Energy Conversion	1 st Edition	P. W. Culp	John Wiley and Sons
2	Energy Management Handbook	1 st Edition	Wayne C Turner	John Wiley and Sons
3	Bureau of Energy Efficiency Study Material for Energy Managers and Auditors Examination	1 st Edition	BEE, India	Bureau of Energy Efficiency www.beeindia.in

Reference books

S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Handbook on Energy Audit and Management	1 st Edition	Kumar Tyagi	

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/EEAS%20ebooks/1.3_energy_management_and_audit.pdf
---	---

MOOCs Links and additional reading, learning, video material

1	https://www.youtube.com/live/WwBquDjDGOA?feature=shared
2	https://www.youtube.com/live/WwBquDjDGOA?feature=shared

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**SoE No.
23EL-101**

VI SEMESTER

23EL1624:PE-III: Lab:Electrical Energy Audit and Safety Analysis

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Identify the lux level and power consumption using energy meter
2. Examine Phase sequence, characteristics of synchronous generator, Types of Earthing
3. Measure Energy Consumption and Measurement of Harmonics
4. Explain Electrical Shock, Fire Safety and efficiency evaluation of solar panels.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	To determine the efficiency of Industrial Compressor
2	To determine the lux level of offices, classrooms, corridors, labs, etc.
3	To assess the energy conservation opportunities in the electrical machines lab
4	To illustrate the percentage loading and the efficiency of a star-connected three-phase induction motor
5	To illustrate the percentage loading and the efficiency of a delta-connected three-phase induction motor
6	To determine Energy conservation in the Fan by using an Electronic Regulator
7	To determine the power factor improvement using PFC / APFC unit for various electrical loads
8	To determine the savings in electric power by replacing lamp replacement
9	To prepare an energy audit report

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**SoE No.
23EL-101**

VI SEMESTER

23EL1625:PE-III: PE-III : Project Planning and Management

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Describe the methodologies involved in project planning and various project planning tools.
2. Analyze the project cost and the risk involved in project execution.
3. Survey the material handling and earth moving equipments.
4. Record the documents and formats involved in project execution and its control.

Unit:1	Project and Project Management	7 Hours
Introduction, Characteristic, Definition, Objectives, Stages, Project planning process, Establishing project organization, Life cycle of project, Project planning methodologies, and growth, Role of project manager.		
Unit:2	Project Planning Tools	8 Hours
Bar chart, Milestone chart, CPM, and PERT, Time estimates, Frequency distribution, Mean, Variance, and standard deviation, Probability distribution, Network analysis, slack, Float, Critical path, Crashing of activity.		
Unit:3	Cost Analysis and Updating	7 Hours
Introduction, Projects cost: Direct cost, Indirect cost, Slope of direct cost curve, Total project cost and optimum duration, Cost optimization. Project Updating: Introduction, Updating process, Data required for updating, Steps in process updating		
Unit:4	Risk analysis and Resource allocation	8 Hours
Certainty, Risk and uncertainty, Risk management, Identification and nature of construction risks, Contractual allocation of risk, Types of risks, Minimizing risks and mitigating losses, Use of expected values, Utility in investment decisions, Decision trees, Sensitivity analysis		
Unit:5	Construction Equipment	7 Hours
Types of compaction Equipment's, Types of Excavation and digging Equipment's, Types of hoisting equipment's, Types of Material handling Equipment's and types of heavy earth moving equipment's.		
Unit:6	Project Execution Monitoring and Control	8 Hours
Types of Contract, Tendering (Techno-commercial aspects), Motivation Theories, Communication and reporting, Importance of coordination, Logistical management, Inspection, Testing, Transportation, Commissioning, Trial run, Documentation required for project handover, Preparing a project report for failure reference.		
Total Lecture Hours		45 Hours

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Textbooks:				
	Title	Edition	Author	Publisher
1	Project Management: A Systemic Approach to Planning, Scheduling and Controlling	2nd Edition	Horald Kerzner	CBS Publishers
2	Project Planning and Control with PERT and CPM	2nd Edition	B. C. Punmia, K.K. Khandelwal	Laxmi Publication.
Reference Book:				
	Title	Edition	Author	Publisher
1	Construction Project Scheduling	5th editions.	Callahan M. T., Quackenbush D. G. and rowing J. E.	McGraw Hill ,New York
2	Construction Planning and Equipment Methods	7th edition	Peurifoy R. L., Ledbetter W. B and schexnayder C.	McGraw Hill, Singapore.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1 <http://link.springer.com/openurl?genre=book&isbn=978-1-4020-8392-1>

MOOCs Links and additional reading, learning, video material

1 <https://youtu.be/W2EdffbwgcM?feature=shared>

2 <https://youtu.be/W2EdffbwgcM?feature=shared>

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VI SEMESTER

23EL1626: PE-III: Lab: Project Planning and Management

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Contrast the main features and importance of the MS Project environment.
2. Develop Barchart, Gantt chart, Milestone chart.
3. Prepare Project Report of Project Planning.
4. Establish CPM and PERT Project Planning Tools.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	Introduction to CPM Techniques
2	Introduction to PERT Techniques
3	Identification of Critical path using Project Planning tool
4	To study Bar Chart for Project Planning
5	To Design Milestone Chart for Project Planning
6	To evaluate Project cost using direct cost and indirect cost
7	To study the risk and mitigation of losses techniques
8	To design decision tree and sensitivity analysis
9	To study various types of construction equipments
10	To study Project Planning Report

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VI SEMESTER

23EL1627: PE-III: Power Electronics Converters for Renewable Energy

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Outline the operating principles and characteristics of renewable energy sources for sustainable energy conversion.
2. Describe and analyze the various solar photovoltaic systems, inverter topologies and configurations.
3. Explain fixed speed and variable speed wind energy conversion systems and configurations.
4. Understand the power quality issues in grid-connected systems for ensuring the quality of power

Unit:1	Introduction to Renewable Energy System	7 Hours
Qualitative study of different renewable energy resources: Solar, wind, Fuel cell, and hybrid renewable energy systems.		
Unit:2	Solar Photovoltaic System	8 Hours
Solar Photovoltaic: PV cell equivalent and V-I, P-V characteristics, DC-DC Converters and its role in Maximum Power Point Tracking (MPPT), MPPT techniques. (Reference and non-reference cell-based algorithm)		
Unit:3	Solar PV Converters and Configurations	7 Hours
PV inverters: PV inverter Configurations, PV Configuration: Standalone, Grid interactive, Bi-Modal systems, Basic introduction to synchronization, Islanding, and control for PV inverters.		
Unit:4	Wind Energy Conversion System (Fixed Speed)	8 Hours
WECS: Introduction to WECS, Wind aerodynamics, Wind turbine technologies, WECS configurations, operation and analysis of fixed speed WECS.		
Unit:5	Variable Speed Wind Energy Conversion System	7 Hours
Variable speed WECS: Introduction, classification, configuration using Induction generator and synchronous generator based variable WECS.		
Unit:6	Power Quality Issues in Grid Integrations.	8 Hours
Type of Hybrid systems, PQ issues in grid interconnections for PV and wind systems, impact on voltage quality and remedial measures.		
Total Lecture Hours		45 Hours

Text books

1	Power Electronics Handbook book Rashid, M. H, Academic press, 2001
2	Power Electronics for Modern Wind Turbines 2006 F. Blaabjerg and Z. Chen, Morgan & Claypool Publishers, 2006

Reference Books

1	Non-conventional Energy Sources 2006 B. H. Khan Tata McGraw-Hill
2	Modern Power Electronics and AC Drives 2001 B. K. Bose Prentice Hall PTR
3	Non-Conventional Energy Resources B H Khan McGraw-Hill Education (India) Pvt Limited, 2006
4	Non-Conventional Energy Sources J D Rai Khanna Publisher, 2008

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VI SEMESTER

23EL1628:PE-III: Lab: Power Electronics Converters for Renewable Energy

Course Outcomes:

Upon successful completion of the course the students will be able to

1. To analyse their behaviour of power converters and understand its role in energy conversion
2. To integrate renewable energy sources like solar PV and wind turbines into electrical systems, including grid-connected and off-grid configurations
3. To design and analyse various power converters for specific renewable energy applications, such as DC-DC converters for solar PV and inverters for wind turbines.
4. TO understand the impact of power electronics on power quality and learn to identify and mitigate power quality issues in renewable energy systems

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	To simulate solar V-I and P-V characteristics of solar photovoltaic cell
2	To study and simulate Wind power system
3	Analysing the performance of a grid-tied solar PV inverter and evaluating active and reactive power flow
4	To study the effect of DC-DC converter on solar PV characteristics
5	To study the the impact of capacitor banks on power quality at the point of common coupling (PCC)
6	To simulate the 2- level and 3- level NPC inverter
7	Analysis of 2-level and 3-level grid connected transformer less inverter in terms of various factors.
8	To study and realise islanding conditions using MATLAB Simulink
9	To study and simulate phase locked loop for synchronisation.
10	To realize the voltage sag, voltage flicker, and harmonics issues in case of PV/Wind based grid connected systems.

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VI SEMESTER

23EL1629:PE-III: Embedded System

Course Outcomes

1. Program 8051 microcontroller to meet the requirements of the user.
2. Interface peripherals like switches, LEDs, stepper motor, Traffic lights controller, etc.
3. Apply concept & types of interrupts for the given context.
4. Design a microcontroller development board to meet the requirements of the user.

Unit:1	Introduction to Microcontroller	7 Hours
Difference between microprocessor and microcontroller, CISC Vs. RISC design philosophy, Von-Neumann vs. Harvard architecture. 8-bit and 16-bit microcontroller. Architecture of microcontroller. I/O ports, stack and use of stack pointer, priority. Memory structure, Data Memory, Program Memory and execution of programs, different registers (SFR's), addressing modes, timing diagram.		
Unit:2	Microcontroller Integrated Development Environment (IDE)	8 Hours
Editor, linker, loader, debugger, simulator, emulator. Instruction set, instruction formats, concept of assembler directives and various addressing modes of AVR and 8051 family of microcontroller. Basic programming using assembly instructions. Introduction to embedded- C, Integrated Development Environment (IDE), Cross Compiler, ISP, Simple program for delay generation.		
Unit:3	Peripheral Interfaces-1	7 Hours
I/O programming, Interfacing with simple switch, LED. 8 bit and 16 bit Timers, various modes of operations of timers, Counters, PWM programming.		
Unit:4	Peripheral Interfaces-2	8 Hours
Interrupt structure, Interrupt priority, Interrupt programming. Analog to Digital Converter, UART programming, RS232, RS 485 transceivers, I/O expansion techniques, Memory expansion		
Unit:5	External Interfaces	7 Hours
LCD, Keyboard interfacing, Digital to Analog Converters, Stepper Motor interfacing, DC motor interfacing. Introduction to CAN Protocol and its interfacing. Introduction to Bluetooth and USB protocols.		
Unit :6	Introduction to Other Advanced Microcontrollers	8 Hours
Introduction to ARM and PIC processors of MSP 430 microcontroller, 16 bit Microcontrollers overview; features, architecture, addressing modes. Low power feature of MSP 430. 32-bit microcontroller		
Total Lecture Hours		45 Hours

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Text books

1	The 8051 Microcontroller: A System Approach by Muhammad A. Mazidi, 1st Ed., PHI, 2012.
2	The AVR Microcontroller and Embedded Systems: A System Approach by Muhammad A. Mazidi, 1st Ed., PHI, 2013.

Reference Books

1	Arm System Developer's Guide: Designing and Optimizing System Software - Andrew N. Sloss, Elsevier Publication, 2005
2	Embedded System - Raj Kamal, 2 nd Edition, TATA McGraw Hill, 2009.
	Embedded C Programming and the ATMEL AVR by R H Barnett 2nd Ed., Cengage Learning Publication, 2006
3	Designing Embedded System with PIC microcontroller, Tim Wilmshurst, 2nd Ed., Newnes Publication, 2009
4	*Texas Instruments MSP 430 microcontroller, Guide and Datasheet

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://link.springer.com/openurl?genre=book&isbn=978-1-4020-6066-3
2	http://link.springer.com/openurl?genre=book&isbn=978-3-540-25301-3
3	http://link.springer.com/openurl?genre=book&isbn=978-1-4020-8392-1
4	http://link.springer.com/openurl?genre=book&isbn=978-3-642-13635-1

MOOCs Links and additional reading, learning, video material

1	https://nptel.ac.in/courses/117104072
2	https://nptel.ac.in/courses/108102045
3	https://onlinecourses.nptel.ac.in/noc20_ee98/preview

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VI SEMESTER

23EL1630:PE-III: Lab: Embedded System

Minimum Eight Practical's to be performed from the list below

Sr. No.	Experiments based on
1	Study and familiarization of 8051 Microcontroller trainer kit
2	Write an Assembly Language Program for addition of 8-bit numbers stored in an array
3	Write an Assembly Language Program for Multiplication by successive addition of two 8-bit numbers
4	Write an Assembly Language Program for finding largest no. from a given array of 8-bit numbers
5	Write an Assembly Language program to arrange 8-bit numbers stored in an array in ascending order.
6	Stepper motor control by 8051 Microcontroller
7	Interfacing of 8-bit ADC 0809 with 8051 Microcontroller
8	Interfacing of 8-bit DAC 0800 with 8051 Microcontroller and Waveform generation using DAC.
9	Implementation of Serial Communication by using 8051 serial ports.
10	Write an Assembly Language Program for use of Timer/Counter for various applications
11	Implement Traffic light controller/Real-time clock display
12	MINI PROJECT: design an application on MC developer kit

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VI SEMESTER

23EL1631: PE-III: PLC and Industrial Automation

Course Outcomes

1. Explain architecture of industrial automation system.
2. Illustrate the process control, PLC architecture and interfacing
3. Develop PLC ladder logic for industrial applications
4. Demonstrate the function of SCADA with PLC systems

Unit:1	Introduction to PLC and SCADA	7 Hours
Automation overview, Automation requirement, systems, architecture of industrial automation system, introduction of PLC and supervisory control and data acquisition (SCADA). Industrial bus systems: Modbus & profibus		
Unit:2	Controllers & Actuators	8 Hours
PID controller, mechanical switches, solid-state switches, electrical actuators: Solenoids, relays and contactors, ac motor, energy conservation schemes through vfd, dc motors, servo motor, pneumatic and hydraulic actuators.		
Unit:3	PLC operation	7 Hours
Definition, advantages and importance of PLC, history of PLC, architecture and block diagram, types of PLC, CPU unit architecture, memory classification.		
Unit:4	PLC programming	8 Hours
Basic ladder logic function, electrical wiring diagram, scan cycle, programming language of PLC, module addressing, basic relay, input, output and timer counter instruction, arithmetic and comparison function,		
Unit:5	SCADA & distributed control system	7 Hours
Introduction, block diagram, elements of SCADA, features of SCADA, MTU, RTU functions, applications of SCADA, communications in SCADA, introduction to DCS, architecture, input and output modules, specifications of DCS.		
Unit :6	Material handling, automated storage system, and Identification Technologies	8 Hours
The material handling function, its types, analysis for Material handling systems, Storage system performance, automated storage/retrieval systems, work-in-process storage, interfacing handling and storage with manufacturing. Product identification system: Barcode, RFID etc		
Total Lecture Hours		45 Hours

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23EL-101

Text books

1	Programmable Logic controllers and Industrial Automation by Madhuchhanda Mitra, Samarjit Sen Gupta, Penram International Publishing India Pvt. Ltd, 2017
2	The AVR Microcontroller and Embedded Systems: A System Approach by Muhammad A. Mazidi, 1st Ed., PHI, 2013.

Reference Books

1	Programmable Logic Controllers, Principles and Applications, John W. Webb, Ronald A Prentice Hall of India Pvt. Ltd, 5th Edition, 2002
2	Industrial Instrumentation and Control, S.K. Singh, The McGraw-Hill Companies, 2007

MOOCs Links and additional reading, learning, video material

1	https://youtu.be/zno8BYcdQzk?si=I6xOQaDMfvfcu_ES
2	https://youtu.be/x3MUGVKWXdw?si=BVXQxV3YcxFYebhz
3	https://youtu.be/OOSO0VWhaMU?si=8XmrXHAwCv9Wqx8
4	https://youtu.be/r3cW9AyFPB8?si=fGY2D8_V59Ps_2LR

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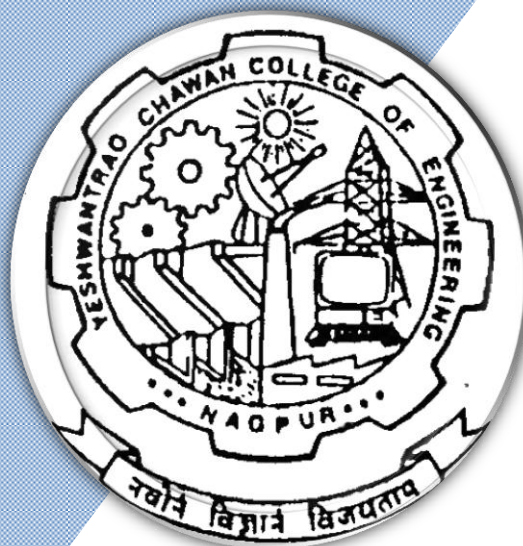
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Bachelor of Technology

SoE & Syllabus 2023

7th Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



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B.TECH SCHEME OF EXAMINATION 2023
 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Electrical Engineering)
 B. Tech in Electrical Engineering

SoE No.
23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
SEVENTH SEMESTER															
1	7	PC	EL	23EL1701	High Voltage Engineering	T	3	0	0	3	3	30	20	50	3 Hrs
2	7	PC	EL	23EL1702	Lab : High Voltage Engineering	P	0	0	2	2	1		60	40	
3	7	PC	EL	23EL1703	Switchgear & Protection	T	3	0	0	3	3	30	20	50	3 Hrs
4	7	PC	EL	23EL1704	Lab : Switchgear & Protection	P	0	0	2	2	1		60	40	
5	7	PC	EL	23EL1705	Electric Vehicles	T	3	0	0	3	3	30	20	50	3 Hrs
6	7	PC	EL	23EL1706	Lab : Electric Vehicles	P	0	0	2	2	1		60	40	
7	7	PE	EL		Professional Elective-V	T	3	0	0	3	3	30	20	50	3 Hrs
8	7	PE	EL		Lab : Professional Elective-V	P	0	0	2	2	1		60	40	
9	7	MDM	EL		MD Minor Course-V	T	2	0	0	2	2	30	20	50	3
10	7	STR	EL	23EL1707	Project Phase-II	P	0	0	8	8	4		60	40	
11	7	STR	EL	23EL1708	Campus Recruitment Training (CRT)	P	0	0	0	0	2			100	
12	7	STR	EL	23EL1709	Comprehensive Evaluation of Core Knowledge	P	0	0	2	2	1		60	40	
TOTAL							14	0	18	32	25				

Professional Electives -V

1	7	PE-V	EL	23EL1721	PE-V : Testing and Maintenance of Electrical Machines
2	7	PE-V	EL	23EL1722	PE-V : Lab : Testing and Maintenance of Electrical Machines
3	7	PE-V	EL	23EL1723	PE-V : Industrial Safety
4	7	PE-V	EL	23EL1724	PE-V : Lab : Industrial Safety
5	7	PE-V	EL	23EL1725	PE-V : Fundamentals of Power Quality
6	7	PE-V	EL	23EL1726	PE-V : Lab : Fundamentals of Power Quality
7	7	PE-V	EL	23EL1727	PE-V : FACTS Devices
8	7	PE-V	EL	23EL1728	PE-V : Lab : FACTS Devices
9	7	PE-V	EL	23EL1729	PE-V : Computer Methods in Power System
10	7	PE-V	EL	23EL1730	PE-V : Lab : Computer Methods in Power System
11	7	PE-V	EL	23EL1731	PE-V : Biomedical Instrumentation
12	7	PE-V	EL	23EL1732	PE-V : Lab : Biomedical Instrumentation

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B.Tech in Electrical Engineering

**SoE No.
23EL-101**

VII Semester

23EL1701:High Voltage Engineering

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Explain various breakdown mechanism and over voltages.
2. Identify propagation of travelling waves along with insulation coordination.
3. Analyze generation and measurement of high voltage and current.
4. Evaluate Non-destructive and high voltage testing of electrical apparatus.

Unit:1	Breakdown Mechanism in Dielectrics	7 Hours
Ionization process : Townsend's criterion for breakdown, Break-down in electro-negative gases, Time -lag for breakdown, Streamer theory for breakdown in gases, Paschen's law, Breakdown in non-uniform fields, corona discharges and introduction of corona, post breakdown phenomenon and applications, practical considerations in using gases for insulation purposes, vacuum insulation, liquid as insulators, conduction and breakdown in pure and commercial liquids. Intrinsic electromechanical and thermal breakdown. Breakdown of solid dielectric in practice, breakdown in composite dielectric.		
Unit:2	Lightning and switching over voltages	8 Hours
Mechanism of lightning types of strokes, parameter and characteristics of lightning strokes, characteristics of switching surges; power frequency over voltages, control of over voltages due to switching. Protection of lines by ground wire, protection by Lightning Arrester (LA), gap type and gapless LA, selection of LA ratings, Surge absorbers.		
Unit:3	Travelling Waves and Insulation Co-ordination	7 Hours
Travelling waves on transmission lines, classifications of lines, attenuation and distortion of travelling waves, reflection and transmission of waves, behaviour of rectangular waves at transition points. Introduction to insulation co-ordination and associated terms, impulse wave-form, introduction to Basic Insulation Level (BIL), Reduced BIL and Switching Impulse Level (SIL).		
Unit:4	Generation of High Voltage and Currents	8 Hours
Generation of High D.C. voltages by rectifiers, voltage doubler and multiplier circuits (Derivation not required) electrostatic machines. Generation of high ac voltage by cascade transformers, resonant transformers. Generation of high impulse voltages: Standard impulse wave shapes, analyses of model and commercial impulse generation circuits, waveshape control, Marx Circuit, tripping and control of impulse generation, generation of switching surges, generation of impulse current		
Unit:5	Measurement of High Voltage and Current	7 Hours
Measurement of high AC and DC voltages by micro ammeter, generating voltmeters, resistance and capacitance potential dividers, series impedance voltmeter, Capacitive Voltage Transformer (CVT), Magnetic type potential transformers, electrostatic voltmeter, peak reading AC voltmeters, sphere gap arrangement, measurement of impulse voltage by potential dividers and peak reading voltmeters. Measurement of High AC/DC currents: Measurement of high frequency and impulse current by resistive shunts (Bifilar strip shunt only).		

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Unit :6	Non Destructive and High Voltage Testing of Electrical Apparatus	8 Hours
Non-destructive testing : Measurement of DC Resistivity, measurement of dielectric constant and loss-factor (low and power frequency only), Schering bridge for high voltage circuits, for high dissipation factor for three terminal measurements, transformer ratio arm bridges, partial discharge measurements by straight detector, balance detectors, calibration of detectors, discharge detection in power cables. High voltage testing: Testing of insulators, bushings, isolators, circuit breakers, cables, transformers, lightning arresters and power capacitors.		
Total Lecture Hours		45 Hours

Text books

SN	Title	Edition	Author	Publisher
1	EHV AC Transmission	2nd	R.D.Begamudre	New Age International Publisher
2	High Voltage Engineering	3rd -2006	M. S. Naidu and V. Kamaraju	McGraw-Hill Publisher
3	High Voltage Engineering	1st -1994	C.L. Wadhwa	New Age International Publisher

Reference Books

SN	Title	Edition	Authors	Publisher
1	Advances in High Voltage Engineering	2004	M. Haddad and Warne	IET

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/High%20Voltage%20Engineering/HVE-M.S.Naidu-V.Kamaraju.pdf
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/B9ObXfifl3Q?si=yNwuV3SAp3z7-wDc
2	https://youtu.be/sU7a9Jm0G54?si=pyQifkZzUT1J-d1
3	https://youtu.be/sU7a9Jm0G54?si=pyQifkZzUT1J-d1

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VII SEMESTER

23EL1702:Lab:High Voltage Engineering

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Demonstrate High voltage equipment and its rating in laboratory.
2. Test for breakdown voltage, resistivity, dielectric constant and tan delta of Transformer oil.
3. Measure breakdown voltage of dielectric medium.
4. Determine high voltage AC, DC or Impulse Voltage.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	Experiments based on
1	Study of High Voltage Laboratory Equipments.
2	Calibration of Panel Voltmeter by Sphere Gap.
3	Study of Corona effect
4	Study of Movement of arc in horn gap
5	To determine Flash over voltage test: 11 kV pin type insulator.
6	Determination of string efficiency of suspension insulator
7	Determination of breakdown voltage for transformer oil sample
8	Determination of breakdown voltage for solid insulator
9	To study Cable Fault locator
10	Measurement of Resistivity of Transformer oil..
11	Measurement of dielectric constant of transformer oil.

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VII SEMESTER

23EL1703: Switchgear & Protection

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Explain the various basic principles of the protection system.
2. Illustrate overcurrent and distance protection schemes.
3. Classify and select the different types of circuit breakers.
4. Choose various protection schemes used for Electrical Equipment.

Unit:1	Introduction	7 Hours
General Philosophy of Protective Relaying: Protective Zones. Primary Protection, Back up protection. Primary and Local Back Up. Desirable properties of relay. Introduction to Static relays: - Comparison of static and electro-mechanical relays, two input amplitude and phase comparators. Introduction to Numerical relays:- Basic elements of digital protection, Signal conditioning subsystem, Conversion system subsystem & Digital processing relay subsystem		
Unit:2	Overcurrent Protection	8 Hours
Medium voltage Line Protection: Overcurrent relaying, directional overcurrent relays.		
Unit:3	Distance protection	7 Hours
High voltage line Protection: - Distance relays, carrier distance schemes, Generation of various distance relay characteristics using static comparators.		
Unit:4	Circuit breakers	8 Hours
Arc interruption theory, recovery and Restriking voltage ,RRRV, breaking of inductive & capacitive currents, C. B. rating, different media of arc interruption, overview of oil circuit breakers, Air blast, SF6 and vacuum breakers.		
Unit:5	Equipment Protection	7 Hours
Equipment Protection: Principles of differential relaying, protection, transformers and busbars by differential relaying and other relays. Miniature circuit breakers, moulded case circuit breaker, release, earth leakage circuit breaker.		
Unit :6	Equipment Protection	8 Hours
Protection of Generators Various Faults and Abnormal Operating Conditions, Transverse Differential Protection, Rotor Faults, Abnormal Operating Conditions, Loss of Prime Mover Protection of Induction Motors Various Faults and Abnormal Operating, Inter-turn Faults, Abnormal Operating Conditions from Supply Side and Mechanical Side, Overload. Fuse (wire and HRC).		
Total Lecture Hours		45 Hours

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Text Books				
SN	Title	Edition	Authors	Publisher
1	Protection and Switchgear	2012	R.P.Maheshwari, Nilesh G.Chothani, Bhavesh Bhalija	Oxford University Press
2	Switchgear and Protection	2003	S.R.Bhide and Y.G. Paithankar	PHI
3	Power System Protection and Switchgear	2007	Badri Ram	TMH.
4	Switchgear and Protection	1990	S. S. Rao	Khanna

Reference Books				
SN	Title	Edition	Authors	Publisher
1	The Art and science of protective relaying	1992	Russel, Mason	Wiley Eastern
2	Computer relaying for power system	2009	Arun G. Phadke and James Thorpe	S John Wiley

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20System%20Protection/Fundamentals%20of%20Power%20System%20Protection%20by%20Y.G.Paithankar%20and%20S.R.Bhide.pdf
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/NEXWcOgqZOI?feature=shared
2	https://youtu.be/h8rpdVt9MUo?feature=shared
3	https://youtu.be/8B3JiWo2_gk?feature=shared

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VII SEMESTER

23EL1704: Lab: Switchgear & Protection

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Test electromechanical overcurrent relay.
2. Employ various distance protection scheme and draw its operating characteristics.
3. Develop protection scheme for transformer.
4. Illustrate the performance of digital protection relays.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	Design a protection system to protect system for given fault currents & plot the characteristics of relay used (<i>IDMT</i>)
2	Design a protection system to protect system for fault direction & plot the characteristics of relay Used
3	Design a protection system to protect system for Reactance fault only & plot the characteristics of relay used
4	Design a protection system to protect system for Impedance type fault & plot the characteristics of relay used
5	Plot the Characteristics of Numerical Relay L&T make <i>MC61C</i>
6	Study of Differential Protection Scheme
7	Study of Relay Test set & to verify Relay Characteristics of <i>ICM21N</i>
8	Identify Different Circuit Breaking Devices
9	To Study ANSI Device Numbers (ANSI - American National Standards Institute)
10	To study MICOM P430 distance protection relay.
11	To Study Minliec make SPPR & Overload Relay
12	To study Generator Protection Scheme
13	To study Feeder Protection Scheme
14	To Study Percentage biased Differential Protection

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VII SEMESTER

23EL1705: Electric Vehicles

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Explain the EV structure, its dynamics and details about the power train and propulsion system.
2. Discuss and identify the appropriate battery and its characteristics with various alternating energy sources
3. Illustrate and analyze different motors for EV and HEVs with their modelling
4. Identify, analyze and formulate various power electronics converter for AC and DC drives and their controls.

Unit:1	Introduction to Electric Vehicles & Vehicle mechanism	7 Hours
EV System, Components of an EV, History of EV, EV Advantages, EV Market, Vehicle Mechanics: - Roadway Fundamentals, laws of Motion, Dynamics of Vehicle motion (Numerical), Propulsion power, Velocity and acceleration, Propulsion system design.		
Unit:2	Fundamentals of Battery	8 Hours
Battery basics, lead acid battery, alternative batteries, battery parameters (Numerical), technical characteristics of battery, targets and properties of batteries, Cell balancing, battery modeling.		
Unit:3	Other alternative Energy Sources	7 Hours
Fuel cells- Basic Operation, Fuel Cell model and cell voltage, No-Load and Load voltage of a PEM(Numerical), Basic operation of super capacitors and ultra-capacitors, Basic Operation of flywheels		
Unit:4	Electric Machines for EV	8 Hours
Motor and engine ratings, EV and HEV motor requirements, dc and three phase ac machines, space vector representation, d-q modeling, induction machine dq model, power and electromagnetic torque, permanent magnet machines, switched reluctance machines, BLDC machines (Numerical).		
Unit:5	Power Electronics and motor Drives for EV	7 Hours
Electric drive components, dc drives, operating point analysis, ac drives, Buck Converter in Continuous Conduction Mode (CCM) (Numerical), Boundary Conduction Mode (BCM) (Numerical), Discontinuous Conduction Mode (DCM), PM synchronous motor drives, Switched Reluctance motor drives, design of current and speed Controller		
Unit :6	e-Power Train	8 Hours
EV transmission configuration, transmission components, gears, automobile differential, clutch, brakes, ideal gear box, EV motor sizing (Numerical).		
Total Lecture Hours		45 Hours

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- 1 Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, 2005.
- 2 John G. Hayes, John G. Hayes, "Electric Powertrain- Energy Systems, Power Electronics and Drives for Hybrid"

Reference Books

- 1 Electric and Fuel Cell Vehicles", John Wiley & Sons, 2018

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- 1 <http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Vehicles/Modern%20Electric,%20Hybrid%20Electric%20&%20%20Fuel%20Cell%20Vehicles%20-%20Mehrdad%20Ehsani.pdf>
- 2 <http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/ELECTRICAL%20DRIVE-A%20TEXT%20BOOK%20OF%20ELECTRICAL%20TECHNOLOGY%20VOLUME-III/CH-43.pdf>

MOOCs Links and additional reading, learning, video material

- 1 <https://www.youtube.com/watch?v=UgtjRob5qMg&list=PLyqSpQzTE6M9spod-UH7Q69wQ3uRm5thr>
- 2 <https://youtu.be/V004WUdpHeA?feature=shared>
- 3 https://youtu.be/T5P9b0_Fv6w?feature=shared
- 4 https://youtu.be/Ig5CeBs95_g?feature=shared

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VII SEMESTER

23EL1706: Lab: Electric Vehicles

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Interpret the configuration and operation of BLDC motor.
2. Demonstrate the operation of PMDC motor.
3. Illustrate the operation of Plug-in Electric Vehicle Charging System.
4. Develop the simulation model of bidirectional dc to dc converter.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	To determine an Electric Vehicles operation using BLDC Hub Motor
2	To determine the operation of an Electric Vehicles using BLDC Hub Motor under loading condition
3	To determine an Electric Vehicles operation using BLDC Motor under loading condition
4	To determine the operation of the Permanent Magnet DC motor by reversal of rotation, and braking
5	To determine the operation of the Permanent Magnet DC motor and, correspondingly conduct load test
6	To study On-Board and OFF-Board battery charger for Electric Vehicles
7	To study and simulate ON-Board (Plug-in Electric Vehicle) battery charger (for G2V mode)
8	To study and simulate ON-Board (Plug-in Electric Vehicle) battery charger for Grid-to-Vehicle (G2V mode) and Vehicle-to-Grid (V2G mode)
9	To design a battery bank with Li-ion cells
10	Battery management System for Li-ion cell battery bank

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VII SEMESTER

23EL1707: Project Phase-II

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Identify a relevant research problem in Electrical Engineering through critical analysis of current issues.
2. Review and interpret existing literature to define objectives and scope of the proposed project work.
3. Design and develop a solution using appropriate hardware/software tools with proper specifications.
4. Analyze, test, and validate the developed system to ensure it meets the defined objectives.
5. Prepare a comprehensive project report and present findings effectively in both written and oral formats.

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VII SEMESTER

23EL1708: Campus Recruitment Training

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Analytical skill improvement of logical reasoning for professional responsibilities.
2. Develop communication, overall personality.

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VII SEMESTER

23EL1709: Comprehensive Evaluation of Core Knowledge

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VII SEMESTER

23EL1721:PE-V: Testing and Maintenance of Electrical Machines

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Classify, the causes of hazards, accidents, shock and the remedial action taken against the electrical shock.
2. Conclude different types of tests and the various maintenance techniques to be employed on various electrical machines and its installation.
3. Describe the factors affecting the life of insulation, its testing and maintenance.
4. Distinguish the various tests to be conducted on distribution transformer, I. S. Standards.

Unit 1	Safety & Prevention of Accidents	7 Hours
Definition of terminology used in safety; safety, hazards, accident, major accident hazard, responsibility, authority, accountability, monitoring, I.E. Act & statutory regulations for safety of persons & equipments working with electrical installation, Dos & don'ts for substation operators as listed in IS Meaning & causes of electrical accidents factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers		
Unit 2	Introduction to Testing and Maintenance	8 Hours
Objectives of testing, significance of I.S.S. concept of tolerance, routine tests, type tests, special tests, Methods of testing a) Direct, b) Indirect, c) Regenerative. Concept of routine, preventive & breakdown maintenance, advantages of preventive maintenance, procedure for developing preventive maintenance schedule, Factors affecting preventive maintenance schedule. Introduction to total productive maintenance.		
Unit 3	Testing & maintenance of rotating machines	7 Hours
Type tests, routine tests & special tests of 1 & 3 phase Induction motors, Routine, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors as per IS 9001:1992. Parallel operation of alternators, Maintenance schedule of alternators & synchronous machines as per IS 4884-1968. Brake test on DC Series motor.		
Unit 4	Testing & maintenance of Insulation	8 Hours
Classification of insulating materials as per I.S. 8504(part III) 1994, factors affecting life of insulating materials, measurement of insulation resistance & interpretation of condition of insulating. Methods of measuring temperature of internal parts of windings/machines & applying the correction factor when the machine is hot.		
Unit 5	Testing & maintenance of Transformer	7 Hours
Listing type test, routine test & special test as per I.S. 2026-1981. Procedure for conducting following tests: Measurement of winding resistance, no load losses, & no load current, Impedance voltage, load losses, Insulation resistance, Induced over voltage withstand test, separate source voltage withstand test, Impulse voltage withstand test, Temperature rise test of oil & winding, Different methods of determining temp rise-back to back test, short circuit test, open delta (delta – delta) test. Preventive maintenance & routine maintenance of distribution transformer as per I.S. 10028 (part-III): 1981, Periodic checks for replacement of oil, silica gel, parallel operation of 1 & 3 phase transformer, load sharing calculations (numerical).		

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Unit 6	Installation	8 Hours
Factors involved in designing the machine foundation, Requirement of different dimension of foundation for static & rotating machines procedure for levelling & alignment of two shafts of directly & indirectly coupled drives, effects of misalignment. Installation of rotating machines as per I.S. 900-1992. Use of various devices & tools in loading & unloading, lifting, carrying heavy equipment.		
Total Hours		45 Hours

Text Books:

S. N.	Author	Title	Publisher
01.	B. V. S. Rao	Operation and Maintenance of Electrical machines Vol – I	Media Promoters & Publisher Ltd. Mumbai
02.	B. V. S. Rao	Operation and Maintenance of Electrical machines Vol – II	Media Promoters & Publisher Ltd. Mumbai

Reference Books:

S. N.	Author	Title	Publisher
01.	B. L. Theraja	Electrical Technology Vol I to IV	S. Chand & Co., New Delhi
02.	C. J. Hubert	Preventive Maintenance Hand Books & Journals	

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1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Machines/A%20Textbook%20of%20Electrical%20Technology%20Volume%20II%20AC%20and%20DC%20Machines-1.pdf
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/AWL-XQwxUdM
2	https://youtu.be/ikqXDWrwf4c?feature=shared

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VII SEMESTER

23EL1722:PE-V : Lab: Testing and Maintenance of Electrical Machines

Minimum Eight Practical's to be performed from the list as below

S. N.	Experiments based on
1	Perform the no load test, measure winding resistance for a single-phase induction motor and determine its performance.
2	Perform no load and blocked rotor test on three-phase induction motor to determine the equivalent circuit.
3	Perform the brake load test on the three phase Induction motor to plot the following operating characteristics, [(i) torque versus speed, (ii) current drawn versus output and (iii) power factor versus output]
4	Prepare the maintenance schedule & trouble shooting chart for the single-phase induction motor.
5	Prepare trouble shooting chart for 3 phase Transformers.
6	Perform the phasing out and polarity tests on the three-phase transformer.
7	For the motor tested in no-load and blocked rotor test, plot the circle diagram and judge its performance.
8	Prepare the maintenance schedule & trouble shooting chart for the three-phase induction motor.
9	Prepare the maintenance schedule & trouble shooting chart for DC shunt motor.
10	Prepare the maintenance schedule & trouble shooting chart for DC shunt generator.
11	Prepare the maintenance schedule & trouble shooting chart for DC series motors.
12	Prepare the maintenance schedule & trouble shooting chart for the DC machine (motor / Generator).

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VII Semester

23EL1723:PE-V: Industrial Safety

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Understand the necessity of safety, safety policy, hazards, and risk assessment
2. Classify the types of fire and respective fire extinguishers employed
3. Develop safety management system with its respective policies involved
4. Examine the safety issues involved in construction and machine work

Unit:1	Introduction	8 Hours
Need, Safety and Productivity, Accident, Injury, Unsafe act, Unsafe condition, Reportable accidents. Theories of accident causation, Objectives of safety, Role of management, Supervisors, Workmen, Unions, Government and voluntary agencies. Safety policy. Safety Officer-responsibilities, and authority. Need of safety committee, Personnel protective equipment (PPE).		
Unit:2	Safety Planning and Industrial Hazards	7 Hours
Safety planning, Strategic planning, Safety procedure, Safety tools, Introduction to Industrial Hazards, Causes, Various methods for analyzing hazards, Risk assessment analysis, Qualitative, and quantitative analysis, Failure mode and effect analysis (FMEA), Maximum credible accident analysis (MCAA), Failure tree analysis, Event tree analysis, HAZAN, HAZOP, Managerial oversight review technique (MORT), Incident and critical incident review technique, Safety integrity level (SIL), Safety audit objective, and procedure.		
Unit:3	Fire Safety	8 Hours
Combustible matter, Flammable/Combustible liquids, Classification of petrochemicals Liquids as per NFPA, Combustible gases, Combustion and its types, Oxygen content in air by weight, and volume, Combustion of solid, Liquid and gases Exothermic and Endothermic reactions, Jet and Flash, Flames and its types, Premixed, Diffusion, turbulent stationary and propagating flames burning velocity, Fire, Classification		
Unit:4	Fire Protection Equipment	7 Hours
Types of extinguishing media of agent, Principles of fire extinguishing methods, Cooling, Starvation, Smothering (Blanketing), Retarding chain reaction, Extinguishing property of water, Characteristics of ideal liquid extinguishing agent, Various forms of water like solid stream, Fog and spray, Types of foam concentrate, Protein, AFFF, Fluoro protein, Alcohol types, Low, Medium and high expansion foam, Physical and chemical properties of foam, Various types of dry chemical powders and their uses, Carbon dioxide, Halons, FM200 and similar extinguishing, Agents, Sprinklers, Automatic alarms water tenders, Fire extinguishers, Fire prevention and inspection procedures, Fire protection law.		
Unit:5	Safety Management System	8 Hours
Principle of organizing for health, and, environmental, Activities, Organization structure, Function & Responsibilities, Safety management system, Objectives of health, Safety and environment policy, Responsibility for implementation of HSE policy, Factory safety committee, Structure and functions, accident prevention.		
Unit 6	Safety Issues in Construction, and Machine	7 Hours
Construction safety during excavation and filling, under-water works, Under-pinning & shoring. ladders & scaffolds, Tunneling, Blasting, Demolition, Confined space, Temporary structures, Indian standards and the		

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National Building Code provisions on construction safety, Machinery safeguard-Point-of- Operation, Principle of machine guarding, Safety in turning, and grinding, Welding and Cutting-Safety, Precautions of Gas welding and Arc Welding, Material Handling-Classification, and safety consideration, Material Handling equipment-operation & maintenance.

Total Lecture Hours | **45 Hours**

Textbooks:

SN	Title	Edition	Author	Publisher
1	Industrial Safety Management	2005	L. M. Deshmukh	McGraw Hill Education, New York
2	Hazard Analysis Techniques for System Safety	2005	Ericson, Clifton A.	Wiley Publication, N. J. USA
3	Industrial Safety and Health Management	2009	Asfahl, C. Ray Rieske, David W.	Prentice Hall, N. J. USA
4	Essentials of Fire Fighting	—	Carl Goodson	Fire Protection Publication, 5th edition

Reference Books

SN	Title	Edition	Authors	Publisher
1	Industrial Safety, Health and Environment management Systems	2000	R.K Jain	Khanna Publications
2	Safety management System and Documentation training Programme handbook	2000	Paul S V	CBS Publication

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Machines/A%20Textbook%20of%20Electrical%20Technology%20Volume%20II%20AC%20and%20DC%20Machines-1.pdf
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/jFDWIKayrTc?feature=shared
2	https://youtu.be/v-eltsixu4I?feature=shared
3	https://youtu.be/USGuag1Jids?feature=shared

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**SoE No.
23EL-101**

VII Semester

23EL1724:PE-V: Lab: Industrial Safety

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	To measure the illumination level
2	To assess the heat stress in the work environment
3	To measure number of air changes
4	To measure sound levels
5	To determine concentration of inflammable vapors
6	Determination of fire load, types and uses of different types of fire canisters, fire hoses, and fire trucks
7	To measure vibrations of machines and equipment
8	To perform continuity test for electrical circuits, earthing continuity test
9	To measure insulation resistance

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**SoE No.
23EL-101**

VII Semester

23EL1725:PE-V: Fundamentals of Power Quality

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Classify different various power quality problems and identify their causes, effects, and solutions.
2. Evaluate the voltage sag in power system with different conditions such as LG, LLG, and LLLG faults
3. Explain the fundamentals of harmonics and choose suitable passive and active power filter for harmonics mitigation.
4. Illustrate the need, and use of custom power and network configuring devices to address the power quality issues.

Unit:1	Overview and definition of power quality	8 Hours
Overview and definition of power quality (PQ): Sources of pollution and regulations, Power quality problems: rapid voltage fluctuations voltage unbalance, Voltage dips and voltage swells, Short duration outages, long duration variations, power acceptability curves		
Unit:2	Voltage sag analysis	7 Hours
Definitions Voltage sag analysis: Sag caused by motor starting, Sag caused by utility fault clearing, Sag magnitude and duration calculations, RMS voltage, calculation in single phase systems, Computers, AC and DC drives etc. performance in presence of sag.		
Unit:3	Harmonic Analysis	8 Hours
Power system harmonics: Harmonic analysis, Harmonic sources and their effects, Introduction to power converters, Fourier analysis, Total harmonic distortion, rms & average value calculation, Effects of harmonic distortion on power factor.		
Unit:4	Filter Design	7 Hours
Filters: passive filters, active filters, hybrid filter design and working principles		
Unit :5	Control of APF and configuring devices	7 Hours
Control of APF: Instantaneous reactive power theory (p-q theory) , Synchronous reference frame theory(d-q theory), Synchronous detection theory, Regulation of DC link voltage and frequency domain control. Network configuring devices: Solid State Current Limiter (SSCL), Solid State Breaker (SSB), Solid State Transfer Switch (SSTS)		
Unit 6	Custom power devices	8 Hours
Introduction to custom power devices, Dynamic Voltage Restorer (DVR) , Distribution Static Compensator (DSTATCOM) and Unified Power Quality Conditioner (UPQC).		
Total Lecture Hours		45 Hours

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Text Books				
S.N	Title	Edition	Author	Publication
1	Power Systems Quality	1st edition	W. Dugan, M. F. Mcgranaghan	Wiley-Hill
2	Power Quality	1st edition 2002 E book 2017	C. Sankaran	CRC Press
3	Understanding Power Quality Problems: Voltage sag and interruptions	2011	M. H. Bollen Ledwich	Wiley India

Reference books				
S.N	Title	Edition	Author	Publication
1	Power System Harmonics	2nd edition, 2003	J. S. Arillaga	Wiley
2	Power Quality Enhancement using custom power devices	2002	Arindam Ghosh Ledwich	Kluwer Academic Publishers

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1	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20Electronics/Muhammad%20H.%20Rashid-Power%20electronics%20_%20devices,%20circuits,%20and%20applications-Pearson%20(2014).pdf
2	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20Electronics/%5bBin_Wu,_Yongqiang_Lang,_Navid_Zargari,_Samir_Kour(BookZZ.org).pdf
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/XwB33QdNAnA?feature=shared
2	https://youtu.be/XwB33QdNAnA?feature=shared

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VII Semester

23EL1725:PE-V: Lab: Fundamentals of Power Quality

Minimum Eight Practical's to be performed from the list as below

Sr. No.	List of Experiments
1	Transient due to capacitor energization
2	Voltage sag in a power system with faults such as LG, LLG, and LLLG.
3	Voltage sag due to an induction motor.
4	Evaluation of Harmonics in an uncontrolled front-end rectifier
5	Analysis of active front-end rectifier
6	Single-phase Power factor correction rectifier
7	Single-phase tuned passive power filter
8	Single-phase damped passive power filters.
9	Clark's and Park's transformation.
10	Hysteresis modulation technique.
11	Single-phase shunt active power filter with hysteresis modulation.

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VII Semester

23EL1727:PE-V: FACTS Devices

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Understand FACTS Concept, various FACTS Controllers, its classification and explain its applications in Transmission system.
2. Apply different shunt and series compensators and its control schemes
3. Analyze voltage and phase angle regulators in power system
4. Analyze the FACTS concept using combine series-shunt and series-series controller to evaluate the improved transmission system performance.

Unit 1	Flexible AC Transmission Systems (FACTS)	8 Hours
FACTS concept and General System Consideration, Transmission interconnections, Flow of power in an AC System, factors affecting the Loading Capability, power flow and Dynamic Stability Consideration of Interconnected Transmission. Importance of controllable Parameters, FACTS Controller. HVDC and FACTS		
Unit 2	Static shunt compensators	7 Hours
SVC and STATCOM, Objectives of Shunt Compensation, Methods of Controllable Var Generation, Static Var Compensators SVC and STATCOM, Control scheme for SVC and STATCOM, Comparison between STATCOM and Static Var System (SVS).		
Unit 3	Static Series Compensators	8 Hours
GCSC, TSSC, TCSC and SSSC, Objectives of series Compensation, Variable Impedance Type Series compensators, Switching Converter Type Series Compensators, Control Schemes for GCSC, TSSC, TCSC and SSSC, External (System) Control for Series Reactive Compensators		
Unit 4	Static Voltage and Phase Angle Regulators	7 Hours
TCVR and TCPAR, Objectives of Voltage and phase angle regulators, Approaches to Thyristor Controlled Voltage Regulators (TCVR) and Thyristor Controlled Phase Angle Regulators (TCPAR), Switching Converter- Based Voltage and Phase Angle regulators, Hybrid Phase Angle Regulators.		
Unit 5	Shunt-Series Compensators: UPFC	7 Hours
Shunt series Compensators UPFC, Operating modes of UPFC, Basic control system for P and Q control, Comparison of UPFC to Series Compensators and Phase angle regulators.		
Unit 6	Other FACTS Controllers	8 Hours
Series-series compensators IPFC, Basic structure and operation, Thyristor controlled braking resistor		
Total Lecture Hours		45 Hours

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Text Books

S.N	Title	Edition	Author	Publication
1	Understanding FACTS	2001	Narayan G.Hingorani	Standard Publishers
2	FACTS : Controllers in Power	1st edition 2007	K. R. Padiyar	New Age International
3	Transmission & Distribution	1st edition 2002	R. Mohan Mathur, Rajiv K Verma	Wiley

Reference Books

S.N	Title	Edition	Author	Publication
1	Flexible AC Transmission System (FACTS)	4th	Edited by Yong Hua and Johns	IEEE Press

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Suported%20file/Suprted%20file/e-copies%20of%20books/Electrical%20Engineering/FACTS/Understanding-Facts-Narain-G-hingorani.pdf
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/Xkd-8nizakY?feature=shared
2	https://youtu.be/Xkd-8nizakY?feature=shared

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**SoE No.
23EL-101**

VII Semester

23EL1728: Lab PE-V: FACTS Devices

Course Outcomes

- 1) To implement and design different series compensators and shunt controllers
- 2) To examine and apply voltage regulators in power system
- 3) To evaluate the transmission line issues and its mitigation using FACTS controllers
- 4) To apply and analyse the FACTS concept using combine series-shunt controller for improved transmission system performance

SN	List of Experiments
1	To study transmission Line and effect of parameter variations on active and reactive power.
2	To study Thyristor Controlled Reactor connected to transmission system
3	To study working characteristics of Thyristor Switched Series Capacitor
4	To study working characteristics of TCSC characteristics.
5	To study voltage regulation using Shunt Capacitor
6	To Study Static Synchronous Series Compensator and its various operating modes
7	To study STATCOM and its various operating modes
8	To study the UPFC characteristics
9	To Study Sub-Synchronous Resonance and its mitigation using NGH-SSR Damper Scheme.

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**SoE No.
23EL-101**

VII Semester

23EL1729:PE-V: Computer Methods in Power System

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Compute different Matrices using graph theory
2. Make use of different methods for Load Flow studies
3. Analyze the system for different types of faults
4. Deduce different methods for Transient Stability Studies.

Unit:1	Incidence and network matrices	8 Hours
Incidence and network matrices: - Graph incidence Matrices, Primitive network, formation of network matrices by singular transformations		
Unit:2	Algorithm for single phase network	7 Hours
Algorithm for formation of Bus Impedance and Bus Admittance matrix for system without mutual coupling		
Unit:3	Three Phase Networks	8 Hours
Three Phase Networks: - Three phase balance network elements with balanced and unbalanced excitation incidence and network matrices for three phase element Algorithm for formation of three phase bus impedance matrices without mutual coupling		
Unit:4	Short circuit studies	7 Hours
Short circuit studies: Three phase network short circuit calculations using bus impedance matrix for balanced and unbalanced faults. Computer programme for short circuit studies on simple system		
Unit:5	Transient stability studies	8 Hours
Transient stability studies: Modelling of synchronous machine, power system network for transient stability studies. Numerical solution of swing equation by modified Euler and Runge Kutta 4th order method.		
Unit:6	Load Flow Studies	7 Hours
Load Flow Studies: Power system load flow equation, solution technique: Gauss Seidal , Newton Raphson and fast decoupled technique with and without (voltage) control buses. Representation of tap changing and phase shifting transformers. Elementary load flow programmes		
Total Lecture Hours		45 Hours

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23EL-101

Text books:

S. N	TITLE	EDITION	AUTHOR	PUBLISHER
1	Computer Methods in Power Systems	1st 1968	Stag and El – Abiad	Mc Graw Hill
2	Elements of Power System Analysis	1982	William D.Stevenson	Mc Graw Hill

Reference books:

S. N	TITLE	EDITION	AUTHOR	PUBLISHER
1	Computer Analysis in Power System	1982	R.N.Dhar	Mc Graw Hill
2	Modern Power System Analysis	3rd-2006	D.P.Kothari and I.J.Nagrath	TMH

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/CMPS/Computer%20Methods%20In%20Power%20Systems%20Analysis%20(%20PDFDrive.com%20).pdf
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MOOCs Links and additional reading, learning, video material

1	https://www.youtube.com/watch?v=l9mdlbr3dV8&pp=ygUqTIBURUwgVklERU8gT04gdHJhbnNpZW50IHNOYWJpbG10eSBzdHVkaWVz
2	https://www.youtube.com/watch?v=UeaTgT2p-WI&list=PLRWKj4sFG7-6gWwDMLI0Wy5DDRqyKP1uQ
3	https://www.youtube.com/watch?v=rEyE3NxK8vE&pp=ygUgBnB0ZWwgdmkZW8gb24gbG9hZCBmbG93IHNOdWRpZXNM%3D

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**SoE No.
23EL-101**

VII Semester

EL1730:PE-V: Lab: Computer Methods in Power System

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Understand the main features and importance of the MATLAB/ SCI LAB mathematical programming environment.
2. Interpret and visualize simple mathematical functions and operations thereon using plots/display.
3. Apply programming knowledge to edit compile, debug, correct, recompile and run.
4. Interpret Evaluate, analyze and plot results.

Minimum Eight Practical's to be performed from the list as below

Sr. No.	Experiments based on
1	Write a program to find Bus Incidence Matrix.
2	Write a program to find Basic Cutset, Basic Close Loop, Branch path incidence matrix.
3	Write a program to obtain Ybus by Singular Transformation
4	Write a program to find Zbus by building algorithm method
5	Write a program to obtain Ybus by building algorithm method
6	Write a program to determine fault current & faulted bus voltage for three phase to ground fault.
7	Write a program to determine fault current & faulted bus voltage for single phase to ground fault.
8	Write a program to plot swing curve by using Euler's method.
9	Write a program to find Branch admittance matrix
10	Write a program to find loop impedance matrix
11	Write a program to find bus voltages by using Gauss Seidal Iterative method

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**SoE No.
23EL-101**

VII Semester

23EL1731:PE-V: Biomedical Instrumentation

Course Outcomes

Upon successful completion of the course the students will be able to

1. Understand the physiology of biomedical system
2. Measure biomedical and physiological information
3. Discuss the application of Electronics in diagnostics and therapeutic area
4. Measure biomedical and biochemical information

Unit:1	Introduction To Biomedical Instrumentation	7 Hours
Need and necessity, parameters to be measured, Respiration rate, pulse and blood pressure, sugar levels, scope for non invasive methods. Pacemakers, Defibrillators, Ventilators, Nerve and muscle stimulators, Diathermy, Heart Lung machine, Audio meters		
Unit:2	Bio Potential Electrodes	8 Hours
Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode- skin interface, half cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes – surface, needle and micro electrodes and their equivalent circuits. Recording problems – measurement with two electrodes.		
Unit:3	Electrode Configurations	7 Hours
Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG, ERG and EOG – unipolar and bipolar mode.		
Unit:4	Bio Amplifier	8 Hours
Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference		
Unit:5	Measurement of Non-Electrical Parameter	7 Hours
Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.		
UNIT 6	Bio-Chemical Measurement	8 Hours
Biochemical sensors - pH, pO ₂ and pCO ₂ , Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).		
Total Hours		45 Hours

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23EL-101

Text Books

Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.

Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.

Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.

Reference Books

1. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004

2. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGrawHill Publisher, 2003.

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**SoE No.
23EL-101**

VII Semester

23EL1732: PE-V: Lab: Biomedical Instrumentation

SN	List of Experiments
1	To measure Simple Op Amp Circuit parameters
2	To Design and analysis of biological pre-amplifiers.
3	Experiment of Thermistors.
4	To measure Blood pressure.
5	To record and analyse ECG signal
6	To record EMG-Signal.
7	To measure respiration rate.
8	To measure and record peripheral blood flow.
9	To Study characteristics of optical Isolation amplifier.
10	To measure Blood Glucose.

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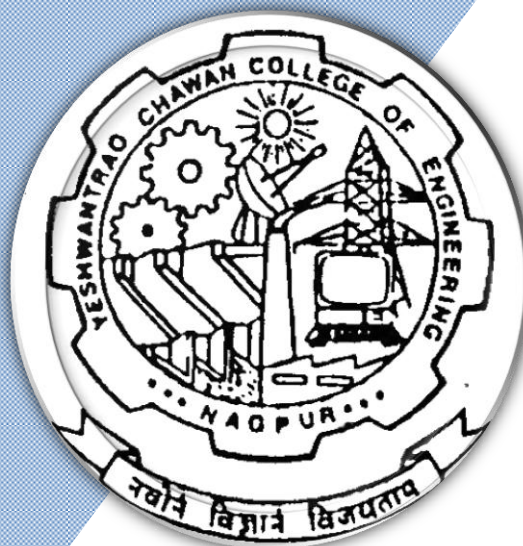
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Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

8th Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
 (An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.TECH SCHEME OF EXAMINATION 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

SoE No.
 23EL-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
EIGHTH SEMESTER																
1	8	PE	EL		Professional Elective-VI	T	3	0	0	3	3	30		100		
2	8	MDM	EL		MD Minor Course-VI	T	2	0	0	2	2	30	20	50	3	
3	8	STR	EL	23EL1801	Internship / On Job training	P	0	0	18	18	7		60	40		
TOTAL							5	0	18	23	12					

GRAND TOTAL							120	0	88	214	176				
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Professional Electives -VI					
1	8	PE-VI	EL	23EL1821	PE-VI : Introduction to Fuzzy Logic Control and Neural Network
2	8	PE-VI	EL	23EL1822	PE-VI : Hybrid Electric Vehicles
3	8	PE-VI	EL	23EL1823	PE-VI : Fundamentals of Smart Grid
4	8	PE-VI	EL	23EL1824	PE-VI : EHVAC-HVDC Transmission
5	8	PE-VI	EL	23EL1825	PE-VI : Switched Mode Power Conversion
6	8	PE-VI	EL	23EL1826	PE-VI : Power System Reliability
6	8	PE-VI	EL	23EL1827	PE-VI : Agricultural Electricity Distribution System

Multidisciplinary Minor Courses			
		Track 1	Track 2
Courses	Sem	Electric Vehicles	Solar Engineering
MDM-I	3	(MDM1EL101) Introduction to Electric Vehicles	(MDM1EL201) Introduction to Solar -Thermal Energy
MDM-II	4	(MDM2EL102) Energy storage devices	(MDM2EL202) Semi-conductor material for Solar Photovoltaic cells
MDM-III	5	(MDM3EL103) Electric Machines	(MDM3EL203) Solar Power Plant Design
MDM-IV	6	(MDM4EL104) Power Electronics and Motor drives	(MDM4EL204) Solar rooftop:Design and Installation
MDM-V	7	(MDM5EL105) Drives and Autonomous Vehicle	(MDM5EL205) Technical and economic analysis of Solar PV
MDM-VI	8	(MDM6EL106) Hybrid Electric Vehicle	(MDM6EL206) Applications of Solar Energy

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**SoE No.
23EL-101**

VIII Semester

23EL1801: Internship / On Job training

Students would be required to undergo internship in a reputed industry or organization for at least 4 months after VII semester. The evaluation will be continuous through internship seminars. They would submit a report, give seminar to present the work done during internship followed by viva voce for final evaluation.

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SoE No.
23EL-101

VIII Semester

23EL1821: PE-VI: Introduction to Fuzzy Logic Control and Neural Networks

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Recall, explain, solve and analyse the principles of fuzzy logic and control.
2. Explain and discuss adaptive fuzzy control.
3. Explain, analyse and solve problems in basic neural networks and associative memories
4. Explain, analyse and solve problems on recurrent networks and neural control.

Unit 1	Introduction to fuzzy system	8 Hours
Fundamental concepts of fuzzy systems Fuzzy sets, Approximate reasoning Representing set of rules. Fuzzy knowledge based (FKBC) parameters. Introduction rule and data base inference engine, choice of fuzzification and defuzzification processes.		
Unit 2	Nonlinear fuzzy control	7 Hours
Introduction, Control problem, FKBC as nonlinear transfer element, types of FKBC		
Unit 3	Adaptive Fuzzy control	8 Hours
Introduction, design, and performance evaluation, main approach to design.		
Unit 4	Artificial Neural Network	7 Hours
Fundamental concept of ANN. Model of artificial neural network (ANN), Learning & adaptation learning rules. Feed forward networks: Classification Model, features & decision, regions, Minimum distance classification, perceptron, delta learning rules for multi perceptron layer, generalized learning rules, back propagation algorithm, back propagation training, learning factors.		
Unit 5	Recurrent networks	7 Hours
Mathematical foundation of discrete time & gradient type Hopfield networks, transient response & relaxation modeling.		
Unit 6	Associative memories, self-organizing networks and Neural Control	8 Hours
Basic concept & recurrent associative memory, Bi-directional associative memory, Hamming net & MAXNET Unsupervised learning of clusters, , feature mapping, self-organizing feature maps, Basics of Neural Network Control, Predictive Control.		
Total Lectures		45 Hours

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Text books

S.N	Title	Year/Edition	Author	Publisher
1	Introduction of Artificial Neural Networks	1992	Jacek Zurada	JPH
2	An Introduction to Fuzzy Control	2010	D. Driankov	Springer
3	Design of Neural Networks	2nd edition	Hagen, Demuth, Beale	Cengage Learning, ISBN-10: 0-9717321-1-6, ISBN- 13: 978-0-9717321-1-7

Reference books

S.N	Title	Year/Edition	Author	Publisher
1	Neural Network & Fuzzy Systems	1992	Bart Kosko	Prentice Hall of India
2	Neural Networks	2009	Simon Haykin	(Maxwell) Macmillan Canada Inc.)
3	Fuzzy Sets: Uncertainty and information	1988	Klir and Folger	Prentice Hall of India
4	MATLAB Toolbox			

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	Not Available
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MOOCs Links and additional reading, learning, video material

<https://youtu.be/QlhHqMnd9Wo?feature=shared>

<https://youtu.be/pKeVMlkFpRc?feature=shared>

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SoE No.
23EL-101

VIII Semester

23EL1822: PE-VI: Hybrid Electric Vehicles

Course Outcomes:

Upon successful completion of the course the students will be able to

- 1) Understand the architecture, types, and operational modes of EVs and HEVs including autonomous technologies.
- 2) Analyze the design and performance aspects of HEV powertrains including fuel economy and gear systems.
- 3) Apply knowledge of power electronics in HEVs for control and charging systems.
- 4) Evaluate plug-in HEV configurations, component sizing, safety, and regenerative braking systems.
- 5) Examine V2G technology, charging infrastructure, maintenance, and end-of-life aspects of HEVs.

Unit 1	Introduction	8 Hours
EVs and Hybrids, HEVs, series HEV, parallel HEV, series-parallel HEV, costs and emission, autonomous cars, types of HEVs		
Unit 2	Hybrid Electric Vehicles Powertrain	7 Hours
Brake specific fuel consumption, conventional, series, and series-parallel hybrid systems, planetary gears, powertrain of 2004 Toyota Prius, two-mode power train, various modes		
Unit 3	Power Electronics in HEVs	8 Hours
Rectifiers, converters, inverters, EV, and PHEV battery chargers, thermal management		
Unit 4	Plug-in HEVs	7 Hours
PHEVs and EREVs, power management, design, and component sizing, maintenance, and safety, regenerative braking		
Unit 5	Vehicle-to-Grid Technology	8 Hours
Hydraulic Hybrid Vehicles, off-road, and diesel HEVs, applications, and reliability of HEVs, issues in HEV (EMC, noise vibration harshness, electromechanical, end-of-life etc.,)		
Unit 6	Charging, maintenance, repairs and replacement	7 Hours
Charging standards, and infrastructure, wireless power transfer, impact of solar charging on grid, de-energizing, maintenance, remove, and replace, completion of work, roadside assistance		
Total Lecture Hours		45 Hours

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Text Books

SN	Title	Edition	Author	Publisher
1.	Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles	2018	John G. Hayes G. Abas Goodarzi	John Wiley & Sons
2.	Electric and Hybrid Vehicles	2016	Tom Denton	Routledge
3.	Hybrid Electric Vehicles – Principles and Applications with Practical Perspectives	2017	Chris Mi, M. Abul Masrur, David Wenzhong Gao	John Wiley & Sons

Reference Books

SN	Title	Edition	Author	Publisher
1.	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles	Third Edition (2018)	Mehrdad Ehsani, Yimin Gao, Stefano Longo and Kambiz M. Ebrahimi	Taylor & Francis
2.	Hybrid Vehicles and Hybrid Electric Vehicles- New Developments, Energy Management and Emerging Technologies	2015	Hilda Bridges	Nova Science Publishers, Inc. New York

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Vehicles/Modern%20Electric,%20Hybrid%20Electric%20&%20%20Fuel%20Cell%20Vehicles%20-%20Mehrdad%20Ehsani.pdf
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/3E1SXG7VkQk?feature=shared
2	https://youtu.be/bHrWjMVOpag?feature=shared

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SoE No.
23EL-101

VIII Semester

23EL1823: PE-VI: Fundamentals of Smart Grid

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Compare conventional and smart grid and illustrate role of stake holders and functions of smart grid.
2. Identify components and computational tools for smooth functioning of smart grid.
3. Determine the performance of smart grid based on congestion, security and contingency studies for optimal solutions.
4. Discuss designing of smart grid with options like automation, sustainable energy and storage.

Unit 1	Introduction to Smart Grid & Power System Enhancement	7 Hours
Introduction to smart grid, Comparison between Present grid and Smart grid, Electricity Act 2003, Energy Conservation Act 2001, Energy Independence and Security, computation intelligence, Communication Standards, Environment and Economics. General view of the Smart grid market drivers, Function and role of stakeholder, Smart grid based performance measures, Representative Architecture, Functions of smart grid components		
Unit 2	Smartgrid Communications	8 Hours
Communication and measurement, Monitoring, PMU, Smart meters, Measurement technologies, GIS and Google mapping tools, multi agent technology, microgrid and smart grid comparison.		
Unit 3	Performance Analysis Tools for Smart grid Design	7 Hours
Congestion management effect, load flow for smart grid design, Static Security assessment (SSA) and contingencies, Contingencies and their classification, contingency studies for smart grid.		
Unit 4	Computational Tools for Smart grid Design	8 Hours
Introduction to computational tools, Decision support Tools (DS), Heuristic Optimization, Evolutionary Computational Techniques, Adaptive Dynamic Programming Techniques, Hybridizing optimization techniques and applications to the smart grid, Computational Challenges.		
Unit 5	Pathway for designing Smart grid	7 Hours
Introduction to Smart Grid Pathway Design, Barriers and Solutions to Smart Grid Development, General Level Automation, Bulk Power Systems Automation of the Smart Grid, Distribution System Automation Requirement of the Power Grid, End User/Appliance Level of the Smart Grid, Applications for Adaptive Control and Optimization.		
Unit 6	Renewable Energy and Storage:	8 Hours
Sustainable energy options for the smart grid, Penetration and variability issues associated with sustainable energy technology, Demand-response issue, Electric vehicles and Plug-in Hybrids, PHEV Technology, Environmental Implications, Storage Technologies, Tax Credits.		
Total Lecture Hours		45 Hours

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1	https://drive.google.com/file/d/18vJz86xDDIfPg_AO_1BeRWhqrtWmWawY/view
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MOOCs Links and additional reading, learning, video material

1	https://youtu.be/tWL87K-qC-0?feature=shared
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2	https://youtu.be/fojsAvPjgRs?feature=shared
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SoE No.
23EL-101

VIII Semester

23EL1824: PE-VI: EHVAC-HVDC Transmission

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Analyse Power handling capacity of EHVAC Transmission systems.
2. Explain Corona, the concept of Electrostatic and electromagnetics, Electrical safety.
3. Classify HVDC Transmission system , Analyse the methods of HVDC Control.
4. Design of Harmonic filters and reactive power configuration, HVDC Circuit breaker and Types and applications.

Unit 1	Power handling and voltage gradient	7 Hours
Power handling capacities of EHV AC transmission lines. Voltages gradients: Electric field of point charge, sphere gap line-charge. Single and three phase lines, and bundled conductors. Maxwell's potentials coefficients.		
Unit 2	Electrostatic and electromagnetic fields of EHV lines & corona	8 Hours
Electrostatic and electromagnetic fields of EHV lines, electric shock and Threshold current , calculation of electrostatic field of A.C. lines (3 phase single and double circuit lines only). Effect of high electrostatic field. Corona: Types, critical disruptive voltages, Factors affecting corona, Methods for reducing corona power loss (empirical formula), corona current waveform, audible noise and radio interference.		
Unit 3	HVDC Power transmission	7 Hours
DC Power transmission technology: Introduction, comparison of AC and DC Transmission, application of DC transmission, Description of DC transmission system, configuration, planning for HVDC transmission, types of DC link. Introduction to HVDC light, Earth electrode and earth returns. Introduction, objectives, location and configuration, resistance of electrodes, means of reducing earth electrode resistance		
Unit 4	Analysis of HVDC converters	8 Hours
Analysis of HVDC converters: Pulse number, choice of converter configuration, simplified Graetz circuit, converter bridge characteristics, characteristics of twelve pulse converter Power flow control in HVDC system :- Constant current. Constant voltage, constant ignition and excitation angle control, control characteristics.		
Unit 5	Harmonic Filters & Reactive power compensation	7 Hours
Harmonic Filters :- Introduction, Filters, surge capacitors and damping circuits, shunt filters, series filters, AC filters, design of AC filters and tuned filters, double frequency and damped filters, cost considerations and ratings. Harmonics on D.C side of converters. DC Harmonics filters. - Reactive power requirement of HVDC converters, substations.		
Unit 6	HVDC circuit breakers	8 Hours
HVDC circuit breakers: - Introduction, construction and principle of operation. Interruption of DC current, application of MRTB, Type of HVDC circuit breaker, capability and characteristics of HVDC circuit breakers		
Total Lecture Hours		45 Hours

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Text books:

	Title	Edition	Author	Publication
1.	EHV AC & HVDC Transmission & Distribution	3rd-2006	S. Rao	Khanna
2.	EHV AC Transmission		Begamudre	New Age International Publisher
3.	Power System Stability and Control	2nd - 2006	P. Kundur	Khanna

Reference books:

1	HVDC Power Transmission System	1982	R.N.Dhar	New Age International Publisher
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**SoE No.
23EL-101**

VIII Semester

23EL1825:PE-VI: Switched Mode Power Conversion

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Outline the basic working principle and operation of the DC-DC converter
2. Design the Closed-Loop Control of Power Converter
3. Describe the operation of Soft Switching Converters
4. Describe the basic working of Unity Power Factor Rectifiers

Unit:1	DC-TO-DC Converter	8 Hours
Introduction, DC-DC Converter, Switched Mode Power Converter, Versatile power converter, Isolated DC-DC Converter.		
Unit:2	Dynamic Analysis of DC-DC Converters	7 Hours
Formulation of dynamic equation of buck and boost converters, averaged circuit models, linearization technique, small-signal model and converter transfer functions		
Unit:3	Controller Design:	7 Hours
Review of frequency-domain analysis of linear time-invariant systems, concept of bode plot, phase and gain margins, bandwidth, controller specifications, proportional (P), proportional integral (PI), proportional derivative (PD) proportional integral derivative controller (PID), selection of controller parameters		
Unit:4	Closed Loop Control of Power Converter	8 Hours
Closed loop control, closed loop performance function, Effect of Input filter on the converter performance, Design criteria for selection of Input filter.		
Unit:5	Soft Switching Converters	8 Hours
Resonant Load Converters, SMPS Using Resonant Circuit, Resonant Switch Converters: Concept of Zero voltage switching, principle of operation, analysis of M-type and L-type Buck or boost Converters. Concept of Zero current switching.		
Unit :6	Unity Power Factor Rectifiers	7 Hours
Power Circuit of UPF Rectifiers, Average Current Mode Control, Voltage Feedforward Controller, Resistor Emulator UPF Rectifiers, Non-linear Carrier Control		
Total Lecture Hours		45 Hours

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Text book

- 1 Course Material on Switched Mode Power Conversion Department of Electrical Engineering Indian Institute of Science Bangalore 560012 V. Ramanarayanan January 15, 2008
- 2 Muhammad H. Rashid, Power Electronics – Circuits, Devices and Applications, Pearson Education
- 3 Benjamin kuo, “Automatic Control Systems” 2008
- 4 R. A. Barapate, “feedback control systems” Tech Max 2009

Reference Books

- 1 Robert Ericson, Fundamentals of Power Electronics, Chapman & Hall, 2004.
- 2 V. Ramanarayanan, Switched Mode Power Conversion, 2007.
- 3 Umanand.L, Power Electronics: Essentials and Applications, Wiley India, 2009.
- 4 B. Jayant Baliga, Power Semiconductor Devices; PWS 1996.
- 5 B. S. Manke, Control System Design, 2010

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link.springer.com/openurl?genre=book&isbn=978-1-4471-4548-6

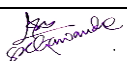
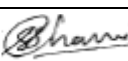
link.springer.com/openurl?genre=book&isbn=978-0-85729-915-4

MOOCs Links and additional reading, learning, video material

www.youtube.com/watch?v=P0MK7sWfs9k&list=PLbMVogVj5nJRY--U9E7dvmqgB9RhGuymk

www.youtube.com/watch?v=P0MK7sWfs9k&list=PLuv3GM6-gsE3onbCZCZLY2sTozcFF71xL

www.youtube.com/watch?v=HcwJKKG_LYY&list=PLwdnzlV3ogoWVgA9fHBV36L_bxWZlpa7X

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**SoE No.
23EL-101**

VIII Semester

23EL1826:PE-VI: Power System Reliability

Course Outcomes:

Upon successful completion of the course the students will be able to

1. To illustrate and apply various reliability analysis techniques.
2. To Make use of various probability distribution methods to assess wind speed and solar radiations.
3. To develop the reliability model of power system and analyze them.
4. To evaluate the reliability of power systems and interconnected networks.

Unit:1	Introduction to General Reliability	8 Hours
Introduction, Types of Systems, Qualitative and quantitative assessment, Reliability definitions and concepts, Reliability indices and criteria, Reliability and availability, Set theory, laws of probability, total probability theorem, probability distributions.		
Unit:2	Introduction to Power System Reliability	7 Hours
Introduction, concept of adequacy and security, system analysis, Reliability evaluation techniques, Reliability improvements, Reliability cost and reliability worth, Reliability activities in system design, Reliability Economics, Network Modelling concept of Reliability.		
Unit:3	Generating capacity—basic probability methods	8 Hours
Introduction, Generation system model, Generating unit unavailability, Capacity outage probability tables, Comparison of deterministic and probabilistic criteria, A recursive algorithm for capacity model building, Recursive algorithm for unit removal.		
Unit:4	Generating capacity—Loss of Load	7 Hours
Concepts and evaluation techniques, Capacity expansion analysis, Scheduled outages, Loss of energy indices, Evaluation of energy indices, expected energy not supplied, Energy-limited systems,		
Unit:5	Interconnected system, Distribution system Reliability	8 Hours
Introduction of interconnected systems, probability array method for two interconnected system, Factors affecting the emergency assistance available through the interconnections. Introduction of Distribution Reliability, Evaluation techniques, Customer and system orientated indices, Load and energy-oriented indices.		
Unit:6	Reliability Analysis of Renewable Generators	7 Hours
Introduction to Renewable Energy sources, Wind speed modelling, reliability models in wind power, Solar radiation data modelling, reliability analysis of SPV in SIPS, Microgrid and Smart grid reliability evaluation		
Total Lecture Hours		45 Hours

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SoE No.
23EL-101

Text books

- | | |
|---|--|
| 1 | Roy Billinton and Ronald N. Allan, "Reliability Evaluation of Power Systems", 2nd Edition, PLENUM PRESS • NEW YORK AND LONDON, 1996 |
| 2 | Ravindra Moharil and Prakash Kulkarni, "Reliability Analysis of Renewable Energy Generators, 1st Edition, Central Techno Publications, Nagpur, 2021. |

Reference Books

- | | |
|---|---|
| 1 | J. Endrenyi, "Reliability Modeling in Electric Power Systems", John Wiley and Sons. |
| 2 | L.S. Srinath, "Concepts of Reliability Engineering", East-West Press (P) Ltd, 1985. |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- | | |
|---|---|
| 1 | https://onlinelibrary.wiley.com/doi/book/10.1002/9781119125204 |
|---|---|

MOOCs Links and additional reading, learning, video material

- | | |
|---|---|
| 1 | https://archive.nptel.ac.in/courses/127/105/127105234/ |
|---|---|

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**SoE No.
23EL-101**

VIII Semester

23EL1827:PE-VI: Agricultural Electricity Distribution System

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Describe rural electricity access, usage patterns, and relevant agricultural energy policies.
2. Explain the components and performance aspects of rural electricity distribution infrastructure.
3. Determine appropriate capacitor usage for improving power factor in agricultural feeders.
4. Evaluate the efficiency and field performance of electrical pumping systems used in irrigation.
5. Design suitable drip and sprinkler irrigation systems with proper pump selection.

Unit:1	Agricultural Energy and Irrigation Context in India	8 Hours
Overview of rural electricity access and usage patterns. Irrigation as a major energy consumer, Policies: PM-KUSUM, feeder segregation, subsidies. Demand estimation and classification of agricultural consumers. Problems with electricity supply.		
Unit:2	Electricity Distribution Infrastructure	7 Hours
Components: transformers, LT/HT feeders, meters. Feeder segregation: design principles and case studies, Voltage profiles, line losses, and grid reliability in rural setups.		
Unit:3	Capacitor Usage on Agriculture Feeders	8 Hours
Introduction, Power factor of irrigation pumps, Capacitors with irrigation pumps, Use of Capacitors reduces current drawn from grid, Rating of Ag capacitors in KVAR, How to select an appropriate capacitor for a pump, Effect of capacitor usage on an LT network		
Unit:4	Electrical Pumping Systems and Field Performance	7 Hours
Types of pumps and motors used in irrigation (centrifugal, submersible). Power factor, efficiency, starter systems, Energy audits, real-world pump efficiency measurement.		
Unit:5	Irrigation pumping: Drip and Sprinkler irrigation	8 Hours
Introduction, Overview of drip irrigation, Layout of the drip system, Operational parameters of a drip irrigation system, Selecting an appropriate pump, Overview of Sprinkler Irrigation, Layout of the sprinkler system, Operational parameters of a sprinkler system.		
Unit :6	Case Studies and Sustainable Electrification Strategies	7 Hours
Solar pump integration and net metering, Microgrid models for agricultural clusters, DSM (Demand Side Management) in agriculture. Real case studies.		
Total Lecture Hours		45 Hours

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Text books				
S.N	Title	Year/ Edition	Author	Publisher
1	Agricultural Electricity Distribution Systems: A Field- Based Study for Electrical Engineers author	2025	Prof. Priya Jadhav Et.al, IITB	Unnat Maharashtra Abhiyan, Centre for Technology Alternatives for Rural Areas, IIT Bombay
2	Fundamentals of Electric Drives	2 nd Edition	G. K.Dubey	Narosa Publications
3	Electrical Power Distribution Systems	2002	V. Kamaraju	Tata McGraw Hill

Reference books				
S.N	Title	Year/Edition	Author	Publisher
1	Fundamentals of Electricity for Agriculture	2023	R. J. Gustafson	American Society of Agricultural Engineers, 2003.

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1	
MOOCs Links and additional reading, learning, video material	
1	https://www.youtube.com/watch?v=9ymeouc6XpA&list=PLwdnzlV3ogoWKGs1XQdyB0qcgijA1PfYJ
2	https://www.youtube.com/watch?v=iQxbMt0t_6U&list=PLLy_2iUCG87A4GdeZYbdh95OJfk7QQaU6

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V Semester

MDM3EL103: Electric Machines

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Understand the use of various types of transformers for various applications.
2. Apply knowledge of various types of Induction machines for various applications.
3. Analyze the applications of synchronous machines and various fractional horse power motors.
4. Determine the functionality of various other special purpose motors.

Unit I: Transformer	(7 Hrs.)
Different types of connections of power and distribution transformers, welding transformers, isolation transformer, pulse transformer, audio transformers and microphone transformers, instrument transformers-current transformers and potential transformers, constant voltage transformer (CVT) and constant current transformer (CCT).	
Unit II: Induction Machines	(8 Hrs.)
Dual winding squirrel cage induction generator, soft starters, reactive power compensation, wound rotor induction generator (WRIG), doubly fed induction generator (DFIG), brushless doubly fed induction generator (BDFIG)	
Unit III: Synchronous Machines	(7 Hrs.)
Wound rotor synchronous generators for renewable energy applications, wound rotor synchronous generators in large and small direct-drive wind turbines, permanent magnet synchronous generators in large and small direct-drive wind turbines	
Unit IV: Fractional Horse Power Motors	(8 Hrs.)
Fractional horse power (FHP) motor, hysteresis motor, Permanent magnet motor, Reluctance motor, Switched reluctance motor.	
Unit V: Special Machines	(7 Hrs.)
Stepper motor and its types, Brushless DC motors	
Unit VI: Some more Special Machines	(8 Hrs.)
Servomotors, Synchro's, and Resolvers	
Total Lecture	45 Hours

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23EL-101

Textbooks:

1. Theraja ,B. L., “Electrical Technology Vol. II”, S Chand and Co., New Delhi
2. Janardanana E. G., “Special Electrical Machines”, PHI INDIA Publication.
3. Ghosh, Smarajit , “Electrical Machines “, Pearson Learning, New Delhi.
4. Fitzgerald,,A.E. Charles Kingsley, Jr., Stephen D. Umans , “Electrical Machinery”, McGraw Hill, New Delhi

Reference Books:

1. Earnest , Joshua , “Wind Power Technology”, PHI Learning, New Delhi, 2014.
2. Mehta, V.K., “Fundamentals of Electrical Engineering”, S Chand and Co., New Delhi.
3. M. G. Say, “The Performance and Design Of Alternating Current Machines”, CBS Publishers and Distributors Pvt. Ltd., 2002.
4. P. S. Bimbhra, “Electric Machines”, Second Edition, Khanna Book Publishing CO. Pvt. Ltd.,

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- 1 www.nptel.iitm.ac.in

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VI Semester

MDM4EL401:Power Electronics and Motor Drives

Course Outcomes:

Upon successful completion of the course the students will be able to Course Objectives:

CO1 To learn different power semiconductor devices.

CO2 To understand different converter topologies, their operation and applications.

CO3 To understand control of motors by various schemes.

CO4 To understand construction and working of special machines.

Unit I: Introduction	(8 Hrs.)
Power semiconductor devices- Diode and Transistors, Power diode, Power BJT, Power MOSFET, IGBT, UJT, PUT, Control and Gate and Base drive circuits, Thyristors, commutation techniques and protection of semiconductor devices, Thyristor, GTO, Triac, Diac and their protection a. principle of work and characteristics. Commutation types, application of thyristors. diode and phase-controlled converter, cycloconverters, voltage-fed converters, current-fed converters, Principle of On-Off control.	
Unit II: AC to DC Converters	(7 Hrs.)
Operation & performance analysis of Uncontrolled & controlled (semi-controlled & full controlled) rectifiers (1- Φ Half Wave Rectifiers, 1- Φ Full Wave Rectifiers, Bridge Rectifiers, 3- Φ Half Wave Rectifiers, 3- Φ Full Wave Rectifiers) application.	
Unit III: DC to DC Converters	(8 Hrs.)
Principle of operation, Performance parameters (HF, THD, DF, and LOH), Single-phase inverters, Inverter voltage control PWM techniques, Three-phase inverters (120° & 180° conduction). Application, Applications of power converters in power supplies Control of DC-DC converters, (Choppers), Buck converter, Boost converter, full bridge switching.	
Unit IV: Fundamental of Drives and Power Electronics for DC Drives	(7 Hrs.)
Introduction to Electric Drives Dynamics of electric drives and control of electric drives. D.C. Drives Controlled rectifier fed D.C. drives, single phase and three phase rectifier control of Separately excited D.C. motor; Dual Converter control of separately excited D.C. motor; Chopper controlled of separately excited dc motor; chopper control of series motor.	
Unit V: Basics of Induction Motor and V/f Control	(8 Hrs.)
Characteristics, Starting Methods, Braking Methods Induction Machines Speed Control of Cage Rotor using as AC voltage controllers, Voltage-Source and Current-Source Inverters. V-by-F Control and other Control Techniques. Introduction to vector control of Induction motor.	
Unit VI: Special Machines in control of drives	
Permanent Magnet Brush-Less Motor Drives, Permanent Magnet Synchronous Motor Drives, and Stepper and Reluctance Motor Drives.	(7 Hrs.)
Total Lecture	45 Hours

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Textbooks:

1. M.H.Rashid ,Power Electronics Circuit's Devices and Applications, 3rd Edition,2004 Prentice Hall Limited
2. Devdutta Shingare, Power Electronics, ElectroTech publishers
3. G. K.Dubey ,Fundamentals of Electric drives ,Narosa Publications,2nd Edition
4. V.Subramaniam ,Electric drives concepts and applications ,Tata McGraw Hill, 2005
5. R. Krishnan, Electric Motor Drives, Prentice Hall India, 2001

Reference Books:

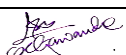
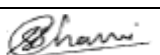
1. C. W. Lander ,Power Electronics, McGraw Hill publication, 1981
2. Dr. M. Ramamoorthy, Thyristors and their Applications 2nd Edition, East West press, 2002
3. Dr.G. K. Dubey, Doralda Sinhaand Joshi ,Thyristor and their Applications, New Age International
4. Theodore Wildi, Electrical Machines Drives and Power Systems, Pearson Education, 6th edition 2008

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1. <https://directory.doabooks.org/handle/20.500.12854/68594>
2. <https://directory.doabooks.org/handle/20.500.12854/41074>
3. <https://directory.doabooks.org/handle/20.500.12854/77053>
4. <https://directory.doabooks.org/handle/20.500.12854/64940>
5. <https://directory.doabooks.org/handle/20.500.12854/69396>

MOOCs Links and additional reading, learning, video material

1. <https://www.youtube.com/watch?v=zWvcM-4aUgg&authuser=1>
2. https://www.youtube.com/watch?v=JZ6f_i4ao6Y&authuser=1
3. <https://www.youtube.com/watch?v=oE9JHETIuns&authuser=1>
4. <https://www.youtube.com/watch?v=sXGAMhcWbow&authuser=1>
5. <https://www.youtube.com/watch?v=il9ngoRstC4&authuser=1>
6. <https://www.youtube.com/watch?v=sXGAMhcWbow&authuser=1>
7. <https://youtu.be/1Auay7ja2oY>

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VII Semester

MDM5EL501: Drives and Autonomous Vehicle

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Understand technology and advancements applied in and connected, Automated and intelligent Cars.
2. Apply knowledge of sensor and wireless technology to execute systems for autonomous cars
3. Analyze the safety challenges associated with future vehicles
4. Critically evaluate the ethical implications of alternative automotive technologies

Unit I: Introduction to Switched Reluctance Motor	(7 Hrs.)
Introduction of various electric motors used in electric vehicles as a drive, Principle of operation, Construction, Principle of Working, Basics of SRM Analysis, Constraints on Pole Arc and Tooth Arc, Torque Equation and Characteristics, Power Converter Circuits, Control of SRM, Rotor Position Sensors, Current Regulators, Microprocessor – Based Control of SRM, Sensor-less Control of SRM.	
Unit II: Introduction to Permanent Magnet Synchronous Machines	(7 Hrs.)
Construction, Principle of Operation, EMF Equation, Torque Equation, Phasor Diagram, Circle Diagram, Comparison of Conventional and PMSM, Control of PMSM, Applications.	
Unit III: Regulations, Policy, Standards of Autonomous Driving	(8 Hrs.)
Regulation bodies for highly automated and autonomous driving, policies and policy making in autonomous driving, autonomous driving, standardization bodies and standards	
Unit IV: Advanced Driver Assistance System (ADAS)	(8 Hrs.)
Recent Driver Assistance System Technology, Integration of ADAS into vehicle electronics, role of sensor data fusion, ADAS ADAS applicable for non-passenger car.	
Total Lecture 30 Hours	

Textbooks:

1. George Dimitrakopoulos, Aggelos Tsakanikas, Elias Panagiotopoulos, "Autonomous Vehicles Technologies, Regulations, and Societal Impacts", Elsevier Publications, 2021.
2. Dietmar P.F. Möller, Roland E. Haas, Guide to Automotive Connectivity and Cybersecurity: Trends, Technologies, 2019, Springer Publications.
3. Hanky Sjafrie, "Introduction to Self-Driving Vehicle Technology", 1st Edition, Published December 11, 2019 by Chapman and Hall/CRC.
4. Janardanana E. G., "Special Electrical Machines", PHIINDIA Publication.

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Reference Books:

1. G. Mullett, Wireless Telecommunications Systems and Networks, Thomson – Delmar Learning, ISBN#1-4018-8659-0, 2006
2. G. Mullett, Basic Telecommunications: The Physical Layer, Thomson – Delmar Learning, ISBN#1-4018-4339-5, 2003
3. Tom Denton, Automobile Electrical and Electronic Systems, 3rd Edition Elsevier Publications 2004.
4. S. K. Sahdev, "Electrical machines", Cambridge, 2018.

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- 1 <https://archive.nptel.ac.in/courses/108/105/108105155/>

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VIII Semester

MDM6EL601:Hybrid Electric Vehicle

Course Outcomes:

Upon successful completion of the course the students will be able to

- 1) Understand the architecture, types, and operational modes of EVs and HEVs including autonomous technologies.
- 2) Analyze the design and performance aspects of HEV powertrains including fuel economy and gear systems.
- 3) Apply knowledge of power electronics in HEVs for control and charging systems.
- 4) Evaluate plug-in HEV configurations, component sizing, safety, and regenerative braking systems.
- 5) Examine V2G technology, charging infrastructure, maintenance, and end-of-life aspects of HEVs.

Unit 1	Introduction	8 Hours
EVs and Hybrids, HEVs, series HEV, parallel HEV, series-parallel HEV, costs and emission, autonomous cars, types of HEVs		
Unit 2	Hybrid Electric Vehicles Powertrain	7 Hours
Brake specific fuel consumption, conventional, series, and series-parallel hybrid systems, planetary gears, powertrain of 2004 Toyota Prius, two-mode power train, various modes		
Unit 3	Power Electronics in HEVs	8 Hours
Rectifiers, converters, inverters, EV, and PHEV battery chargers, thermal management		
Unit 4	Plug-in HEVs	7 Hours
PHEVs and EREVs, power management, design, and component sizing, maintenance, and safety, regenerative braking		
Total Lecture Hours		30 Hours

Text Books

SN	Title	Edition	Author	Publisher
1.	Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles	2018	John G. Hayes G. Abas Goodarzi	John Wiley & Sons
2.	Electric and Hybrid Vehicles	2016	Tom Denton	Routledge
3.	Hybrid Electric Vehicles – Principles and Applications with Practical Perspectives	2017	Chris Mi, M. Abul Masrur, David Wenzhong Gao	John Wiley & Sons

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Reference Books				
SN	Title	Edition	Author	Publisher
1.	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles	Third Edition (2018)	Mehrdad Ehsani, Yimin Gao, Stefano Longo and Kambiz M. Ebrahimi	Taylor & Francis
2.	Hybrid Vehicles and Hybrid Electric Vehicles- New Developments, Energy Management and Emerging Technologies	2015	Hilda Bridges	Nova Science Publishers, Inc. New York

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1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Electrical%20Vehicles/Modern%20Electric,%20Hybrid%20Electric%20&%20Fuel%20Cell%20Vehicles%20-%20Mehrdad%20Ehsani.pdf
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/3E1SXG7VkQk?feature=shared
2	https://youtu.be/bHrWjMVOpag?feature=shared

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V Semester

MDM3EL302:Solar Power Plant Design

Course Outcomes:

Upon successful completion of the course the students will be able to

- 1) Assess customer's PV system requirement
- 2) Plan and arrange for installation
- 3) Coordinate with colleagues at workplace
- 4) Ensure safety at workplace

Unit:1	Types of Solar Power Plant, Grid Connected solar Power Plant, Net Metering Solar Power Plant, Gross meter, Off-Grid / Hybrid solar power plant, Schemes of solar power plant PV module structure inter row spacing calculation, Pitch analysis, Selection of PV module tilt angle, Near shading object calculation, Site survey and plant assessment, selection of site and shadow analysis	8 Hours
Unit:2	Types of Crystalline module cells, Manufacturing process of PV cells, Comparison between mono crystalline and poly crystalline, Selection of PV cells, Selection of front and rear sheet, Selection of PV module glass, Selection of EVA sheet, Bus bar and frame.	7 Hours
Unit:3	Types of solar inverter, Selection of string /central / off grid inverter, Selection of power conditioning unit (PCU), Sizing of solar inverter for roof top and grid connected projects, Selection and sizing of string inverter, Selection and sizing of central inverter.	8 Hours
Unit:4	Sizing of solar cable /DC cable, Sizing of String cable, Derating factor of cables Sizing of AC cable, Sizing of DC cable, ACDB and DCDB Solar PV System, Solar Plant resistance calculation, Preparation AC /DC earthing layout, Selection of lightning protection device, Selection of ESE type Lightning Protection.	7 Hours
Unit:5	IEC Standards,Commissioning System Installation & Pre-Commissioning Checklist, Commissioning Test Sheets. Introduction to State & Central policies, Net meter policy of Maharashtra state, Case Study KUSUM, Introduction to Solar PV Design and Simulation software like HOMER Pro, PV F-Chart, pvPlanner, PVsyst, RETscreen, System Advisor Model (SAM), Solar Pro	8 Hours
Unit :6	Preparation of checklist for maintenance as per OEM recommendation for: Module, Inverter, DC cabling, Battery AC and DC Cabling, Checking functionality and protection system, Measurement of earthing resistance, Efficiency measurement of plant. Monitoring Equipment, Staff Management	7 Hours
Total Lecture Hours		45 Hours

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Text books

- | | |
|---|---|
| 1 | Solar Photovoltaic Technology And Systems, 1st 2013, Chetan Singh Solanki, PHI Learning Delhi |
| 2 | Implementation of Solar Thermal and Photovoltaic Systems, Covrig Claudiu, LAP Lambert Academic Publishing |

Reference Books

- | | |
|---|---|
| 1 | The Solar Electricity Handbook: 2019 Edition 2019: A simple, practical guide to solar energy - designing and installing solar photovoltaic systems. 2019, Michael Boxwell, Greenstream Publishing |
|---|---|

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MOOCs Links and additional reading, learning, video material

- | | |
|---|---|
| 1 | https://youtu.be/ZLgOoMSIS3Y?feature=shared |
| 2 | https://youtu.be/Cew6-aaI0GU?feature=shared |

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VII Semester

MDM5EL502: Technical and Economic Analysis of Solar PV

Course Outcomes

successful completion of the course the students will be able to

1. Explain the economic principles of solar PV generation by analyzing module manufacturing
2. Apply financial decision-making tools to *evaluate* the financial feasibility of solar PV projects.
3. Compare and analyze the technical performance of different tracking systems, as well as various PV configurations.
4. Evaluate the economic viability of different solar PV technologies for specific applications

Unit I: Economics of solar PV generation

(7 Hrs.)

A model on cost and price, analysis of manufacturing cost of modules, Trade-off between cost and efficiency, Installation cost, Design of a standalone PV System

Unit II: Criteria for Financial Decisions

(8 Hrs.)

Future value of Money, Present Worth of Money, The Capital Recovery Factor, Solar Energy Tax Credits, Inflation and Consumer Price Index, Payback Analysis, Net Present Value, Internal Rate of Return

Unit III: Technical analysis of Solar PV System

(7 Hrs.)

Analysis of Fixed, Single axis and Dual axis system, Analysis of standalone and Grid connected PV System

Unit IV: Economic analysis of Different Solar PV Technologies

(8 Hrs.)

Analysis of Mono-c-Si, Poly-c-Si, a-Si, CdTe, CIS Technology

Total Lecture 30 Hours

Textbooks:

1. C.S.Solanki, Solar Photovoltaics - Fundamentals, Technologies and Applications, 2nd edition 2013, PHI Publication
2. G.N.Tiwari, Arvind Tiwari, Shyam, "Handbook of Solar Energy: Theory, Analysis and Applications" Springer Series

Reference Books:

1. B.H.Khan, "Non Conventional Energy Resources", 3rd edition 2017, Mc Graw Hill Publication

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MOOCs Links and additional reading, learning, video material

- | | |
|---|---|
| 1 | Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems [Intro Video] |
| 2 | http://103.152.199.179/YCCE/DTEL%20Material/3.Electrical%20Engineering/DTEL%20PPTs/IV%20SEMESTER/EL-2253%20EEGS/ |

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VIII Semester

MDM6EL602: Applications of Solar Energy

Course Outcomes

successful completion of the course the students will be able to

1. Classify different solar flat-plate air collectors
2. Assess the thermal performance of various solar air-heating applications.
3. Explain the working principle and importance of various solar drying technologies.
4. Analyze the performance of passive and active solar stills with respect to their effectiveness in solar distillation

Unit I: Solar Flat-Plate Air Collectors	(7 Hrs.)
Introduction, Classification of Solar Air Heaters, Nonporous-Type Solar Air Heaters ,Porous-Type Solar Air Heaters, Conventional Nonporous Solar Air Heaters,Double-Exposure Solar Air Heaters,Solar Air Heater with Flow on Both Sides of the Absorber, Introduction to Solar Concentrators.	
Unit II: Solar Water-Heating Systems	(8 Hrs.)
Introduction , Collection-Cum-Storage Solar Water Heater Built-in Storage Water Heater ,Shallow Solar Pond (SSP) Solar Water Heater , Solar Water-Heating System ,Natural Circulation ,Forced-Circulation Solar Water Heater Detailed Analysis of a Double-Loop Solar Water-Heating System	
Unit III: Solar Dryers	(7 Hrs.)
Importance of Solar-Drying , Solar Crop-Drying ,Open-Sun Drying (OSD) , Direct Solar Drying (DSD) , Indirect Solar Drying (ISD) ,PVT Greenhouse Dryer , Reverse-Absorber Cabinet Dryer.	
Unit IV: Solar Distillation	(8 Hrs.)
Importance of Solar Distillation, Working Principle of Solar Distillation, Thermal Efficiency,Instantaneous Thermal Efficiency, An Overall Thermal Efficiency,Basic Heat Transfer, External Heat Transfer ,Internal Heat Transfer ,Overall Heat-Transfer Coefficient ,Distillate Yield ,Other Designs of Passive/Active Solar Stills Passive Solar Still ,Active Solar Still	
Total Lecture	30 Hours

Textbooks:

1. C.S.Solanki, Solar Photovoltaics - Fundamentals, Technologies and Applications, 2nd edition 2013, PHI Publication
2. G.N.Tiwari, Arvind Tiwari,Shyam, "Handbook of Solar Enery:Theory,Analysis and Applications" Springer Series

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Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech SoE and Syllabus 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

Reference Books:

1. B.H.Khan, "Non Conventional Energy Resources", 3rd edition 2017, Mc Graw Hill Publication

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 <http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Electrical%20Engineering/Renewable%20Energy%20Sources/B.H.Khan%20Book%200RES.pdf>

MOOCs Links and additional reading, learning, video material

- 1 [Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems \[Intro Video\]](#)
- 2 <http://103.152.199.179/YCCE/DTEL%20Material/3.Electrical%20Engineering/DTEL%20PPTs/IV%20SEMI-CONDUCTOR/EL-2253%20EEGS/>

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