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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

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)

SoE No. 22EL-101

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

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															
1	1	BS	GE/MTH	22EL101	Differential Equation, Complex Variables and Matrices	T	3	1	0	4	4	30	20	50	3 Hrs
2	1	BS	GE/PHY	22EL102	Engineering Physics	T	3	0	0	3	3	30	20	50	3 Hrs
3	1	BS	GE/PHY	22EL103	Lab: Engineering Physics	P	0	0	2	2	1		60	40	
4	1	HS	GE/HUM	22EL104	Social Science	T	3	0	0	3	3	30	20	50	3 Hrs
5	1	BES	ME/ME	22EL105	Engineering Graphics	T	1	0	0	1	1	30	20	50	3 Hrs
6	1	BES	ME/ME	22EL106	Lab: Engineering Graphics	P	0	0	4	4	2		60	40	
7	1	BES	CT/CT	22EL107	Elements of AIML	T	3	0	0	3	3	30	20	50	3 Hrs
8	1	BES	EL/EL	22EL108	Electrical workshop	P	0	0	2	2	1		60	40	
9	1	BES	EL/EL	22EL109	Fundamentals of Electrical Engineering	T	3	0	0	3	3	30	20	50	3 Hrs
10	1	BES	EL/EL	22EL110	Lab: Fundamentals of Electrical Engineering	P	0	0	2	2	1		60	40	
						TOTAL	**16**	**1**	**10**	**27**	**22**				
List of Mandatory Learning Course (MLC)															
1	1	HS	GE/T&P	MLC2121	YCAP1-Get Set Go	**A**	2	0	0	2	0				
2	1	BES	GE/CHE	GE2132	Environmental Science	**A**	2	0	0	2	0				

SECOND SEMESTER															
1	2	BS	GE/MTH	22EL201	Differential and Integral Calculus	T	3	1	0	4	4	30	20	50	3 Hrs
2	2	BS	GE/CHE	22EL202	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3 Hrs
3	2	BS	GE/CHE	22EL203	Lab: Engineering Chemistry	P	0	0	2	2	1		60	40	
4	2	HS	GE/HUM	22EL204	Professional Communication	T	3	0	0	3	3	30	20	50	3 Hrs
5	2	BES	CV/CV	22EL205	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3 Hrs
6	2	BES	CV/CV	22EL206	Lab: Engineering Mechanics	P	0	0	2	2	1		60	40	
7	2	BES	EE/EE	22EL207	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3 Hrs
8	2	BES	IT/IT	22EL208	Programming for Problem Solving	T	3	0	0	3	3	30	20	50	3 Hrs
9	2	BES	IT/IT	22EL209	**Lab:** Programming for Problem Solving	P	0	0	2	2	1		60	40	
						TOTAL	**18**	**1**	**6**	**25**	**22**				

List of Mandatory Learning Course (MLC)															
1	2	HS	GE/HUM	GE2131	Universal Human Value	**A**	2	0	0	2	0				
2	2	HS	GE/T&P	MLC2122	YCAP2 -Functional English	**A**	2	0	0	2	0				

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 activities decided by course teacher, TA3 - 3 marks on class attendance

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

		June 2022	1.00
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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SoE No. 22EL-101

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

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/HUM	22EL301	Integral Transforms and Partial differential Equations	T	3	0	0	3	3	30	20	50	3 Hrs
2	3	HS	EL/EL	22EL302	Electrical Energy Generation System	T	3	0	0	3	3	30	20	50	3 Hrs
3	3	PC	EL/EL	22EL303	**Lab**: Electrical Engineering Workshop	P	0	0	2	2	1		60	40	
4	3	PC	EL/EL	22EL304	Network Analysis	T	3	0	0	3	3	30	20	50	3 Hrs
5	3	PC	EL/EL	22EL305	**Lab**:Computer Programming	P	0	0	2	2	1		60	40	
6	3	PC	EL/EL	22EL306	Electrical Machines	T	3	1	0	3	3	30	20	50	3 Hrs
7	3	PC	EL/EL	22EL307	**Lab:**Electrical Machines	P	0	0	2	2	1		60	40	
8	3	PC	EL/EL	22EL308	Electrical Measurement & Instrumentation	T	3	0	0	3	3	30	20	50	3 Hrs
9	3	PC	EL/EL	22EL309	**Lab:** Electrical Measurement and Instrumentation	P	0	0	2	2	1		60	40	
10	3	PC	CV/EL	22EL310	Environmental Sustainability, Pollution and Management	**T**	3	0	0	3	3	30	20	50	3 Hrs
					TOTAL THIRD SEM		**18**	**1**	**8**	**26**	**22**				
Audit Courses															
1	3	HS	T&P	MLC2123	YCCE Communication Aptitude Preparation (YCAP3)	**A**	3	0	0	3	0				
2	3	BES	EL	MLC105	Introduction to C language	**A**	2	0	0	2	0				
FOURTH SEMESTER															
1	4	BS	EL/EL	22EL401	Signals and System	T	3	0	0	3	3	30	20	50	3 Hrs
2	4	PC	GE/GE	22EL402	Fundamentals of Management and Economics	T	3	0	0	3	3	30	20	50	3 Hrs
3	4	PC	EL/EL	22EL403	Electrical Machines in Power System	T	3	0	0	3	3	30	20	50	3 Hrs
4	4	PC	EL/EL	22EL404	**Lab:**Electrical Machines in Power System	P	0	0	2	2	1		60	40	
5	4	PC	EL/EL	22EL405	Fundamentals of Power System	T	3	0	0	3	3	30	20	50	3 Hrs
6	4	PC	EL/EL	22EL406	Embedded systems	T	3	0	0	3	3	30	20	50	3 Hrs
7	4	PC	EL/EL	22EL407	**Lab:** Embedded systems	P	0	0	2	2	1		60	40	
8	4	PC	EL/EL	22EL408	Fundamentals of Electrical Drives	T	3	1	0	3	3	30	20	50	3 Hrs
9	4	PC	EL/EL	22EL409	**Lab:** Fundamentals of Electrical Drives	P	0	0	2	2	1		60	40	
10	4	PC	EL/EL	22EL410	**Lab:** Renewable Energy Sources	P	0	0	2	2	1		60	40	
					TOTAL FOURTH SEM		**18**	**1**	**8**	**26**	**22**				
Audit Courses															
1	4	HS	T&P	MLC2124	YCCE Communication Aptitude Preparation (YCAP4)	**A**	3	0	0	3	0				
2	4	BES	EL	MLC106	Object Oriented Programming	**A**	2	0	0	2	0				

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		June 2022	1.00
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

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SoE No. 22EL-101

B.TECH SCHEME OF EXAMINATION 2022

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(Department of Electrical Engineering)

B. Tech in Electrical Engineering

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	22EL501	Control System	T	3	0	0	3	3	30	20	50	3 Hrs
2	5	PC	EL	22EL502	Lab: Control System	P	0	0	2	2	1		60	40	
3	5	PC	EL	22EL503	Power Electronics	T	3	0	0	3	3	30	20	50	3 Hrs
4	5	PC	EL	22EL504	**Lab:** Power Electronics	P	0	0	1	2	1		60	40	
5	5	PC	EL	22EL505	**Lab:** Electronic Engineering Workshop	P	0	0	1	2	1		60	40	
6	5	PE	EL		**Professional Elective -I ***	T	3	0	0	3	3	30	20	50	3 Hrs
7	5	PE	EL		**Professional Elective -II****	T	3	0	0	3	3	30	20	50	3 Hrs
8	5	STR	EL	22EL506	Industrial Training, Seminar and Report	P	0	0	1	1	1		60	40	
9	5	OE	EL		**Open Elective - I**	T	3	0	0	3	3	30	20	50	3 Hrs
10	5	OE	EL		**Open Elective - II**	T	3	0	0	3	3		60	40	
					TOTAL FIFTH SEM		**18**	**0**	**5**	**25**	**22**				

List of Lab. Professional Electives-I *

1	5	PE-I	EL	22EL511	PEI: Electric and Magnetic Field
2	5	PE-I	EL	22EL512	PEI: Electrical Machine Design
3	5	PE-I	EL	22EL513	PEI: Design of Photovoltaic System
4	5	PE-I	EL	22EL514	PEI: Electric Power Utilization

List of Lab. Professional Electives-II **

1	5	PE-I	EL	22EL531	PEII:Illumination Engineering(MOOC)
2	5	PE-I	EL	22EL532	PEII:Energy Storage System
3	5	PE-I	EL	22EL533	PEII:Electrical Wiring :Estimation and Costing
4	5	PE-I	EL	22EL534	PEII:Distributed Generations in Power System

Open Elective-I

1	5	OE-I	EL	22EL551	OEI:Renewable Energy Generation System
2	5	OE-I	EL	22EL552	OEI:Electrical Machines and their Applications
3	5	OE-I	EL	22EL553	OEI:Solar Power Plant Design and Installation

Open Elective-II

1	5	OE-II	EL	22EL571	OEII:Electrical Energy Audit and Safety
2	5	OE-II	EL	22EL572	OEII:Utilization of Electrical Energy
3	5	OE-II	EL	22EL573	OEII:Power System Engineering

Audit Courses

1	5	HS	T&P	MLC2125	YCAP5: YCCE Communication Aptitude Preparation	A	3	0	0	3	0	
2	5	HS	R&D	MLC125	Design thinking	A	2	0	0	2	0	

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							L	T	P	Hrs		MSEs*	TA**	ESE	
SIXTH SEMESTER															
1	6	PC	EL	22EL601	Power System Analysis	T	3	0	0	3	3	30	20	50	3 Hrs
2	6	PC	EL	22EL602	Electric Vehicles	T	3	0	0	3	3	30	20	50	3 Hrs
3	6	PC	EL	22EL603	**Lab:**Electric Vehicles	P	0	0	2	2	1		60	40	
4	6	PE	EL		**Professional Elective -III**	T	3	0	0	3	3	30	20	50	3 Hrs
5	6	PE	EL		**Lab. Professional Elective -III**	P	0	0	2	2	1		60	40	
6	6	PE	EL		**Professional Elective -IV**	T	3	0	0	3	3	30	20	50	3 Hrs
7	6	PC	EL	22EL604	Lab:Simulation of Power Electronics & Power System	P	0	0	2	2	1		60	40	
8	6	PC	EL	22EL605	**Lab.:**Substation Design	P	0	0	2	2	1		60	40	
9	6	PC	EL	22EL606	Project Phase I	P	0	0	4	4	2		60	40	
10	6	OE	EL		**Open Elective - III**	T	3	0	0	3	3	30	20	50	3 Hrs
11	6	OE	EL		**Open Elective - IV**	T	3	0	0	3	3	30	20	50	3 Hrs
					TOTAL SIXTH SEM		**18**	**0**	**12**	**30**	**24**				

List of Professional Electives- III & IV

Professional Electives-III

1	6	PE-III	EL	22EL611	PEIII:Electrical Installation Design
		PE-III		22EL612	PEIII:Lab:Electrical Installation Design
2	6	PE-III	EL	22EL613	PEIII:Electrical Energy Audit and Safety Analysis
		PE-III		22EL614	PEIII:Lab:Electrical Energy Audit and Safety Analysis
3	6	PE-III	EL	22EL615	PEIII:Computer Methods in Power System
		PE-III		22EL616	PEIII:Lab:Computer Methods in Power System
4	6	PE-III	EL	22EL617	PEIII:Project Planning and Management
		PE-III		22EL618	PEIII:Lab: Project Planning and Management

Professional Electives -IV

1	6	PE-IV	PE	22EL631	PEIV: Advanced Power Electronics
2	6	PE-IV	PE	22EL632	PEIV: Advanced Electrical Drives
3	6	PE-IV	PE	22EL633	PEIV: Grid integration in Renewable Energy Systems
4	6	PE-IV	PE	22EL634	PEIV: Power System Operation and Management
5	6	PE-IV	PE	22EL635	PEIV : Microgrid

Open Elective-III

1	6	OE-III	EL	22EL651	OEIII:Renewable Energy Generation System
2	6	OE-III	EL	22EL652	OEIII:Electrical Machines and their Applications
3	6	OE-III	EL	22EL653	OEIII:Solar Power Plant Design and Installation

Open Elective-IV

1	6	OE-IV	EL	22EL671	OEIV:Electrical Energy Audit and Safety
2	6	OE-IV	EL	22EL672	OEIV:Utilization of Electrical Energy
3	6	OE-IV	EL	22EL673	OEIV:Power System Engineering

Audit Courses

1	6	HS		MLC2126	YCCE Communication Aptitude Preparation (YCAP6)	**A**	3	0	0	3	0

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

		June 2022	**1.00**
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Bachelor of Technology

SoE & Syllabus 2022

1st Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

28 June 2019

Nagar Yuwak Shikshan Sanstha's

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(Department of Electrical Engineering)

B. Tech in Electrical Engineering

SoE No. 22EL-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															
1	1	BS	GE/MTH	22EL101	Differential Equation, Complex Variables and Matrices	T	3	1	0	4	4	30	20	50	3 Hrs
2	1	BS	GE/PHY	22EL102	Engineering Physics	T	3	0	0	3	3	30	20	50	3 Hrs
3	1	BS	GE/PHY	22EL103	Lab: Engineering Physics	P	0	0	2	2	1		60	40	
4	1	HS	GE/HUM	22EL104	Social Science	T	3	0	0	3	3	30	20	50	3 Hrs
5	1	BES	ME/ME	22EL105	Engineering Graphics	T	1	0	0	1	1	30	20	50	3 Hrs
6	1	BES	ME/ME	22EL106	Lab: Engineering Graphics	P	0	0	4	4	2		60	40	
7	1	BES	CT/CT	22EL107	Elements of AIML	T	3	0	0	3	3	30	20	50	3 Hrs
8	1	BES	EL/EL	22EL108	Electrical workshop	P	0	0	2	2	1		60	40	
9	1	BES	EL/EL	22EL109	Fundamentals of Electrical Engineering	T	3	0	0	3	3	30	20	50	3 Hrs
10	1	BES	EL/EL	22EL110	Lab: Fundamentals of Electrical Engineering	P	0	0	2	2	1		60	40	
						TOTAL	**16**	**1**	**10**	**27**	**22**				
List of Mandetory Learning Course (MLC)															
1	1	HS	GE/T&P	MLC2121	YCAP1-Get Set Go	**A**	2	0	0	2	0				
2	1	BES	GE/CHE	GE2132	Environmental Science	**A**	2	0	0	2	0				

SECOND SEMESTER															
1	2	BS	GE/MTH	22EL201	Differential and Integral Calculus	T	3	1	0	4	4	30	20	50	3 Hrs
2	2	BS	GE/CHE	22EL202	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3 Hrs
3	2	BS	GE/CHE	22EL203	Lab: Engineering Chemistry	P	0	0	2	2	1		60	40	
4	2	HS	GE/HUM	22EL204	Professional Communication	T	3	0	0	3	3	30	20	50	3 Hrs
5	2	BES	CV/CV	22EL205	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3 Hrs
6	2	BES	CV/CV	22EL206	Lab: Engineering Mechanics	P	0	0	2	2	1		60	40	
7	2	BES	EE/EE	22EL207	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3 Hrs
8	2	BES	IT/IT	22EL208	Programming for Problem Solving	T	3	0	0	3	3	30	20	50	3 Hrs
9	2	BES	IT/IT	22EL209	**Lab:** Programming for Problem Solving	P	0	0	2	2	1		60	40	
						TOTAL	**18**	**1**	**6**	**25**	**22**				
List of Mandetory Learning Course (MLC)															
1	2	HS	GE/HUM	GE2131	Universal Human Value	**A**	2	0	0	2	0				
2	2	HS	GE/T&P	MLC2122	YCAP2 -Functional English	**A**	2	0	0	2	0				

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I SEMESTER

22EL101: Differential Equation, Complex Variables & Matrices

Course Outcomes
Upon successful completion of the course the students will be able to 1. Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems. 2. Determine the various functions of complex numbers. 3. Evaluate the integration of function of complex variables. 4. Use Matrix method to solve system of linear equations, evaluate eigen values - eigen vectors and its applications.

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 field (only up to second order). **(Contemporary Issues related to Topic)**	
Unit IV: Complex Numbers	**(6 Hrs.)**
Basic concepts of complex numbers and its various forms. Separation of real and imaginary parts, De Moivre's theorem, Application of De Moivre's theorem, Exponential function of complex numbers, Circular function of complex numbers, Hyperbolic functions and their inverse, Logarithm of a complex number. **(Contemporary Issues related to Topic)**	
Unit V: Complex Variables	**(7 Hrs.)**
Analytic function, Cauchy-Riemann conditions, Harmonic functions, Finding Harmonic conjugates, Taylor's and Laurent's Theorem (statement only), Examples on Taylor's and Laurent's Theorem, Evaluation integral by using Residue theorem. **(Contemporary Issues related to Topic)**	
Unit VI: Matrices	**(6 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)**	
Total Lecture	**39 Hours**

Textbooks:	
1.	Erwin Kreyzig, Advance Engineering Mathematics, 6th 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.	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/Suported%20file/Supprted%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/111103070
2.	https://onlinecourses.nptel.ac.in/noc19_ma28/preview
3.	https://nptel.ac.in/courses/111/106/111106100/

I SEMESTER

22EL102: 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 particle.
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 particle 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 hypothesis, Wavepacket, Heisenberg uncertainty principle: Significance, Applications. Wavefunction and its probability interpretation, Schrodinger Equation, Particle in infinite potential well, quantum tunnelling. **(Contemporary Issues related to Topic)**	
Unit II: Band Theory of Solids	**7 Hrs.)**
Formation of energy bands in solids; Classification of solids, Energy band diagram of Si/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.)**
Interaction of radiation with matter/ quantum processes, Population Inversion and Optical resonance cavity, Three and four level laser, 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, CRO and its applications. **(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**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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, 2015.

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	chrome- http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Physics/Eisberg%20&%20Resnick%20-%20Quantum%20Physics.pdf
2	chrome- http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Physics/2016_Book_ThePhysicsOfSemiconductors.pdf
3	chrome- http://103.152.199.179/YCCE/Suported%20file/Supprted%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://youtu.be/jaXiOXnJd8s
2.	https://youtu.be/v2zpSFEdvZo
3.	https://youtu.be/tjUUU9f2Wpc
4.	https://youtu.be/qcE2Wcpm05k

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

I SEMESTER

22EL103: 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 particle. 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 particle 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.

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

SN	**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 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 C.R.O.
13.	To measure the phase shift introduced by a phase shift network using Dual beam CRO.

I SEMESTER

22EL104: Social Science

Course Outcomes
Upon successful completion of the course the students will be able to
1. Explain the basic concepts of social sciences.
2. Describe the development of various Civilizations and their culture.
3. Explain the basic idea of Constitution of India and aware about their rights & Duties.
4. Analyze the Impact of Industrialization on Society and discuss the Fundamental Concepts of Society.

Unit I: Social Sciences & Its Utility	**(6 Hrs.)**
Meaning & Scope of Social Science, General Utility of Social Sciences to Engineers, Applied Humanities, Social Engineering, Society its types & Characteristics. **(Contemporary Issues related to Topic)**	
Unit II: Human Civilization	**(7 Hrs.)**
Development of human civilization with specific reference to monumental studies of engineering skill, Ancient Indian Civilization:- a) Indus Valley Civilization b) Vedic Civilization, c) Indian Art & Architecture. **(Contemporary Issues related to Topic)**	
Unit III: Fundamental Concept in Social Science	**(7 Hrs.)**
Social Structure and Social System, Socialization, Social Control and Social Change, Culture: Characteristics and Features. **(Contemporary Issues related to Topic)**	
Unit IV: Introduction to Constitution of India	**(7 Hrs.)**
Significance of Preamble, Fundamental Rights and Duties, Directive principles of state policy. Federal System Concept of industrial Democracy. **(Contemporary Issues related to Topic)**	
Unit V: Industrial Organization & Society	**(6 Hrs.)**
Industrialization and its impact on society, Selection, Training & Motivation of workers, Industrial Psychology, Industrial sociology, Work Organization, Power, Authority and Status system. **(Contemporary Issues related to Topic)**	
Unit VI: Industrial Management	**(6 Hrs.)**
Labour Union Organization, Discipline in Industry, Labour Turnover, Industrial Fatigue of workers, Health and Safety of Workers. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Textbooks:	
1.	S. Shabbir & Sheikh, A New Look Into Social Sciences, S.Chand , New Delhi,1993.
2.	C N Shankar Rao, Sociology Principles of Sociology With An Introduction To Social Thought, S. Chand, New Delhi, 2010.
3.	O P Khanna, Industrial Engineering And Management, Dhanpat Rai Publication, New Delhi, 2010.
4.	Dr. G. N. Nimbarte, Social Science, Sankalp Publications, Nagpur.

Reference Books:	
1.	C. N. Shankar Rao, Sociology: Principal of Sociology with an introduction to social thought, Publication: S. Chand, New Delhi.
2.	O. P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publication, New Delhi.
3.	Reader's Digest Vanished Civilizations, The Reader's Digest Association Limited, New York.
4.	Constitution of India: Dr B. R. Ambedkar: Government of India, Government of India.
5.	B. L. Kayastha, Recent trends in Humanities and Social Sciences, 1st Ed., Akinik Publications, New Delhi.

MOOCs Links and additional reading, learning, video material	
1.	https://mobidrive.com/sharelink/r/4I2bDsxN9YrVI03vMZaInJ5VBpojBmR9EqKv7nin9pkN
2.	https://mobidrive.com/sharelink/r/4I2bDsxN9YrVI03vMZaInJ2sUn37wK4V3CpGhemYRKnz

I SEMESTER
22EL105: 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 **(Contemporary Issues related to Topic)**	
Unit II: Theory of Isometric Projections:	**(2 Hrs.)**
Theory of isometric projection, Method for drawing isometric views, Different problems on isometric projections. **(Contemporary Issues related to Topic)**	
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. **(Contemporary Issues related to Topic)**	
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 **(Contemporary Issues related to Topic)**	
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. **(Contemporary Issues related to Topic)**	
Unit VI: Intersection of Surfaces of solids:	**(2 Hrs.)**
Intersection between similar solids, Intersection between dissimilar solids, Lines and Curves of Intersection. **(Contemporary Issues related to Topic)**	
Total Lecture	**15 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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_2iUCG87Bw9XPfEF3r3EW5UlAOv8iz
2.	https://nptel.ac.in/courses/112105294

I SEMESTER

22EL106 : 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**

I SEMESTER
22EL107: Elements of AIML

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Develop an understanding what is involved in AIML. 2. Understand learning algorithms of AIML. 3. Understand the deep learning. 4. Apply the knowledge for the selection of tool and languages for problem solving 5. Understand the use of AIML for real world problems.

Unit I: Introduction to Artificial Intelligence	**(7 Hrs.)**
What Is Artificial Intelligence? History, AI and Society, Agents and Knowledge based systems, Components of AI **(Contemporary Issues related to Topic)**	
Unit II: Propositional Logic	**(7 Hrs.)**
Propositional Logic, First order logic, limitations of logic, Search, Games and Problem Solving, Reasoning with Uncertainty **(Contemporary Issues related to Topic)**	
Unit III: Machine Learning	**(7 Hrs.)**
Supervised learning, Unsupervised learning, Reinforcement learning: Model based learning, Regression, Decision trees, Linear Discrimination, Kernel Machines and Graphical Models **(Contemporary Issues related to Topic)**	
Unit IV: Artificial Neural Networks and Deep Learning	**(7 Hrs.)**
Biological neural network, Artificial neural network, Hopfield network, Neural Associative memory, Linear networks, Backpropogation algorithm, Support Vector Machines, Basics of deep learning. **(Contemporary Issues related to Topic)**	
Unit V: Introduction to Platforms, Tools, Frameworks and languages for AIML	**(6 Hrs.)**
Top AIML Softwares: Salesforce Einstein, IBM Watson, Deep Vision, Cloud Machine Learning Engine, Azure Machine Learning Studio, Nvidia Deep Learning AI, Playment; Machine learning tools: TensorFlow, Amazon Machine Learning, Accord.NET, Apache Mahout, Shogun; Programming languages: Python, R, Java, Julia, C/C++, Others: Scikit Learn, Theano, Caffe, MxNet, Keras, PyTorch, CNTK, Auto ML, OpenNN, H20: Open Source AI Platform, Google ML Kit **(Contemporary Issues related to Topic)**	
Unit VI: Applications of AI and ML	**(6 Hrs.)**
Working with software based AI Applications, Working with AI in hardware Applications, Health, Banking and Finance, Automobile, Surveillance, Social Media, Education, Space, etc. **(Contemporary Issues related to Topic)**	
Total Lecture	**40 Hours**

Textbooks:	
1.	Wolfgang Ertel, "Introduction to Artificial Intelligence" 2nd Edition, UTiCS, Springer
2.	Ethem Alpaydın ,"Introduction to Machine Learning" 3rd Edition,The MIT Press, Cambridge, Massachusetts London, England.

Reference Books:	
1.	John Paul Mueller, Luca Massaron John Wiley & Sons ,"Artificial Intelligence for Dummies" First, 2018
2.	Steven W. Knox,Wiley" Machine Learning A Concise Introduction" First, 2018

MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/watch?v=kwSTs0QVRfU
2.	https://www.youtube.com/watch?v=GHpchgLoDvI&list=PLp6ek2hDcoNB_YJCruBFjhF79f5ZHyBuz
3.	https://nptel.ac.in/courses/106105077

I SEMESTER

22EL108: Electrical 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	One Lamp Controlled by One Switch and Distribution Board Connection
5	Staircase Wiring, Hospital Wiring and Godown Wiring
6	Master Switch Control Wiring and Intermediate Switch Wiring
7	Design of House Wiring
8	Introduction to Different sensor devices and its demonstration.
9	To Study different protection devices and Importance of Earthing.
10	To Study Circuit and Working of Home Inverter, UPS.

I SEMESTER

22EL109: 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.

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. Fleming's Left-hand Rule. 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. Flemings's Right-hand rule. 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)**

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

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

I SEMESTER

22EL110: 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.

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

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.

I SEMESTER
Audit Course
MLC2121: YCAP1 -Get Set Go

Objective	Outcomes
Get Set Go program is designed to introduce students to the real world. It gives them the skills they need to reach their goals and live up to their full potential at college, home and work. The program was developed with feedback from students; it consists of interactive sessions that include real-life scenarios and role-playing. It can help young adults become more confident and better able to cope with the pressure and stress they face.	The students gain more confidence and skills required to deal with the challenges they will face in college and at home. Their interpersonal and intrapersonal skills are enhanced pushing them to think towards their future and aim for their goals.

Syllabus Subject: Communication Skills – 1st Year, No. of hours - 18

Unit No.	Topic	Duration
1	Topic: Build a foundation for success - 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	2.5 Hours
2	Topic: 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	3.5 Hours
	Practice Conversations, Activity – Pause-Part-Punch, Group Activity	

Unit No.	Topic	Duration
3	Topic: Increase Self Confidence -• Use our experiences to communicate more confidently • Communicate with clarity and conciseness • Discover how past experiences influence behavior	2.5 Hours
4	Topic: 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	4 Hours
	Individual Activity – Sharing of defining moment, Skit to demonstrate Leadership Principles, Stranded on Island	

Unit No.	Topic	Duration
5	Topic: Fundamentals of Communication (Earn the right – Excite -Eagerness) ♣ Elevator Pitch ♣ Develop more Flexibility, ♣ Recap and Summarize	3.5 Hours
6	Activities - – Individual Presentation, Flexibility Drills, Individual Presentations – My Vision Assignment	2 Hours

Reference Books:

1. How to win friends & influence people – Dale Carnegie

I SEMESTER
Audit Course
GE2132: Environmental Science

Course Outcome :

Upon successful completion of the course the students will be able

1. To understand the basic concepts and problems and follow sustainable development practices
2. To enhance knowledge skills and attitude towards environment
3. To understand natural environment and its relationship with human activities.
4. To evaluate local, regional and global environmental topics related to resource use and management.

Unit I: : Introduction	**(2Hrs.)**
Definition, scope and importance; Need for public awareness – institutions in environment, people in environment.	

Unit II: : Natural Resources	**(2 Hrs.)**
Renewable and non-renewable and associated problems; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.	

Unit III: Ecosystems	**(4 Hrs.)**
Concept of an ecosystem – understanding ecosystems, ecosystem degradation, resource utilization. Structure and functions of an ecosystem – producers, consumers and decomposers. Energy flow in the ecosystem – water, carbon, oxygen, nitrogen and energy cycles, integration of cycles in nature. Ecological succession; Food chains, food webs and ecological pyramids; Ecosystem types – characteristic features, structure and functions of forest, grassland, desert and aquatic ecosystems.	

Unit IV: Bio-diversity	**(4 Hrs.)**
Introduction – biodiversity at genetic, species and ecosystem levels Bio-geographic classification of India. Value of biodiversity – Consumptive use value, productive use value, social, ethical, moral, aesthetic and optional vlue of biodiversity. India as a mega-diversity nation; hotspots of biodiversity.Threats to bio-diversity – habitat loss, poaching of wildlife, man-wild life conflicts. Common endangered and endemic plant and animal species of India. Insitu and Exsitu conservation of biodiversity. Role of individual and institutions in prevention of pollution.Disaster management – Floods, earthquake, cyclone, landslides.	

Unit V: Pollution	**(4 Hrs.)**
Definition; Causes, effects and control measures of air, water, soil, marine, noise and thermal pollutions and nuclear hazards. Solid waste management – Causes, effects and control measures of urban and industrial waste.	

Unit VI: Social Issues and the Environment	**(4 Hrs.)**
Unsustainable to sustainable development; Urban problems related to energy; Water conservation, rainwater harvesting, watershed management; Problems and concerns of resettlement and rehabilitation of affected people. Environmental ethics – issues and possible solutions – Resource consumption patterns and need for equitable utilization; Equity disparity in Western and Eastern countries; Urban and rural equity issues; need for gender equity. Preserving resources for future generations. Te rights of animals; Ethical basis of environment education and awareness; Conservation ethics and traditional value systems of India. Climate change, global warming, acid rain, Ozone layer depletion, nuclear accidents and holocasts. Wasteland Reclamation; Consumerism and Waste products. Environment legislations – The Environment (Protection) Act; The water (Prevention and Control of Pollution) Act; The Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislations – environment impact assessment (EIA), Citizens actions and action groups. Public awareness – Using an environmental calendar of activities, self-initiation.	
Unit VII : Human Population and the Environment	**(4Hrs.)**
Global population growth, variation among nations. Population explosion; Family Welfare Programmes – methods of sterilization; Urbanization. Environment and human health – Climate and health, infectious diseases, water-related diseases, risk due to chemicals in food, Cancer and environment. Human rights – equity, Nutrition and health rights, Intellectual property rights (IPRS), Community Biodiverstity registers (CBRs). Value education – environmental values, valuing nature, valuing cultures, social justice, human heritage, equitable use of resources, common property resources, ecological degradation. HIV / AIDS; Women and Child Welfare; Information technology in environment and human health.	
Total Lecture	**24 Hours**

Textbooks:	
1.	Perspectives in environmental studies by A. Kaushik and C. P. Kaushik.
2.	Textbook for Environmental studies by Erach Bharucha for UGC
3.	Textbook of Environmental studies by Shanta Satyanarayan, Dr. Suresh Zade, Dr. Shashikant Sitre & Dr. Pravin Meshram.
4.	Fundamental concepts in Environmental studies by Dr. D.D. Mishra. S. Chand publications

Reference Books:	
1.	Essentials of Ecology and Environmental Science by Dr. S .V .S. Rana,PHI Learning Pvt. Ltd, Delhi
2.	Environmental Chemistry by Anil Kumar De, Wiley Eastern Limited
3.	Environmental Science by T.G. Miller, Wadsworth Publishing Co, 13th edition.
4.	Ecology and Environment by P. D. Sharma, Rastogi publications

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

2nd Semester

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

28 June 2019

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 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

SoE No. 22EL-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															
1	1	BS	GE/MTH	22EL101	Differential Equation, Complex Variables and Matrices	T	3	1	0	4	4	30	20	50	3 Hrs
2	1	BS	GE/PHY	22EL102	Engineering Physics	T	3	0	0	3	3	30	20	50	3 Hrs
3	1	BS	GE/PHY	22EL103	Lab: Engineering Physics	P	0	0	2	2	1		60	40	
4	1	HS	GE/HUM	22EL104	Social Science	T	3	0	0	3	3	30	20	50	3 Hrs
5	1	BES	ME/ME	22EL105	Engineering Graphics	T	1	0	0	1	1	30	20	50	3 Hrs
6	1	BES	ME/ME	22EL106	Lab: Engineering Graphics	P	0	0	4	4	2		60	40	
7	1	BES	CT/CT	22EL107	Elements of AIML	T	3	0	0	3	3	30	20	50	3 Hrs
8	1	BES	EL/EL	22EL108	Electrical workshop	P	0	0	2	2	1		60	40	
9	1	BES	EL/EL	22EL109	Fundamentals of Electrical Engineering	T	3	0	0	3	3	30	20	50	3 Hrs
10	1	BES	EL/EL	22EL110	Lab: Fundamentals of Electrical Engineering	P	0	0	2	2	1		60	40	
						TOTAL	**16**	**1**	**10**	**27**	**22**				
List of Mandetory Learning Course (MLC)															
1	1	HS	GE/T&P	MLC2121	YCAP1-Get Set Go	**A**	2	0	0	2	0				
2	1	BES	GE/CHE	GE2132	Environmental Science	**A**	2	0	0	2	0				

SECOND SEMESTER															
1	2	BS	GE/MTH	22EL201	Differential and Integral Calculus	T	3	1	0	4	4	30	20	50	3 Hrs
2	2	BS	GE/CHE	22EL202	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3 Hrs
3	2	BS	GE/CHE	22EL203	Lab: Engineering Chemistry	P	0	0	2	2	1		60	40	
4	2	HS	GE/HUM	22EL204	Professional Communication	T	3	0	0	3	3	30	20	50	3 Hrs
5	2	BES	CV/CV	22EL205	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3 Hrs
6	2	BES	CV/CV	22EL206	Lab: Engineering Mechanics	P	0	0	2	2	1		60	40	
7	2	BES	EE/EE	22EL207	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3 Hrs
8	2	BES	IT/IT	22EL208	Programming for Problem Solving	T	3	0	0	3	3	30	20	50	3 Hrs
9	2	BES	IT/IT	22EL209	**Lab:** Programming for Problem Solving	P	0	0	2	2	1		60	40	
						TOTAL	**18**	**1**	**6**	**25**	**22**				
List of Mandetory Learning Course (MLC)															
1	2	HS	GE/HUM	GE2131	Universal Human Value	**A**	2	0	0	2	0				
2	2	HS	GE/T&P	MLC2122	YCAP2 -Functional English	**A**	2	0	0	2	0				

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**

		June 2022	1.00	Applicable for AY 2022-23 Onwards
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II SEMESTER
22EL201 : Differential and Integral Calculus

Course Outcomes :

Upon successful completion of the course 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 mathematical equation.
3. Apply the knowledge of Beta and Gamma functions to solve the integrals.
4. Evaluate the multiple integrals and apply it to compute the area and volume of various structures.

Unit I: Differential Calculus I	**(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: Differential Calculus II	**(6 Hrs.)**
Definitions of Curvature, Radius of curvature for cartesian curves, Centre of curvature, Circle of curvature, Procedure for tracing the cartesian curve, Important points (singular points, Multiple points, Double points, Node, Cusp), Problems on tracing of curve. **(Contemporary Issues related to Topic)**	
Unit III: 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. **(Contemporary Issues related to Topic)**	
Unit IV: Integral Calculus	**(6 Hrs.)**
Gamma function, Reduction formula, Transformation of **G**amma function, Beta function, Properties of Beta function, Transformation of Beta function, Relation between Beta and Gamma functions, Differentiation under the integral sign. **(Contemporary Issues related to Topic)**	
Unit V: Multiple integrals	**(7 Hrs.)**
Elementary double integrals and triple integrals, Change of variables (simple transformations) and Jacobian of transformations, Change of order of integration (Cartesian and polar). **(Contemporary Issues related to Topic)**	
Unit VI: Application of Multiple Integral	**(7 Hrs.)**
Surface area, Calculation of mass, Centre of gravity of an arc and Centre of gravity of an area, Volume of solid by revolution of an area (Double integral). **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Textbooks:	
1.	Erwin Kreyzig, Advance Engineering Mathematics, 6th 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, 43rd 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, VolI & 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/Suported%20file/Supprted%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
3.	https://nptel.ac.in/courses/111/106/111106100/

II SEMESTER
22EL202 : Engineering Chemistry

Course Outcomes :

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

1. Illustrate qualitative and quantitative aspects of water for industrial and domestic applications. (L2)
2. Apply concepts of electrochemistry for energy storage devices. (L3)
3. Identify corrosion and discuss its prevention. (L2)
4. Establish insight into engineering materials. (L3)

Unit I : Water Conditioning **(7 Hrs.)**

Introduction, Hardness, Types of hardness, softening of water by lime-soda process, Zeolite process, (principle, advantages, and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles (Scale and sludge, caustic embrittlement), sequestration (carbonate, phosphate) Sterilization of drinking water by chlorination **(Contemporary Issues related to Topic)**

Unit II: Electrochemistry **(6 Hrs.)**

Introduction, metallic and electrolytic conductance, resistance, specific resistance, conductance, specific conductance, equivalent and molar conductance. Variation of conductance with dilution. Electrode and electrode potentials. Nernst Equation. Faraday's laws and Numericals. Industrial applications: Electroforming, Electrowinning, Electrolytic refining. **(Contemporary Issues related to Topic)**

Unit III: Energy Storage Devices Basic concepts **(6 Hrs.)**

Unit III Primary and secondary battery. Energy density, power density, energy efficiency, cycle life, shelf life. Secondary battery: Ni-metal hydride battery, Lithium-ion battery. H2-O2 Fuel cell: Principle, working, advantages, disadvantages, applications. Differences between battery and a fuel cell. Supercapacitors: Definition, types, characteristics, and application. **(Contemporary Issues related to Topic)**

Unit IV: Corrosion **(7 Hrs.)**

Introduction to corrosion, electrochemical and galvanic series,
Types of corrosion: Chemical and electrochemical corrosion. Mechanisms of electrochemical corrosion, Factors influencing corrosion. Differential aeration theory of corrosion,
Forms of corrosion: Pitting corrosion, Intergranular corrosion, Stress corrosion, Waterline. **Corrosion prevention:** Design and material selection, Cathodic and anodic protection. **(Contemporary Issues related to Topic)**

Unit V: Lubricants **(6 Hrs.)**

Introduction, Classification of lubricants, Mechanism of lubrication.
Liquid lubricants, Properties of liquid lubricants & significance–Viscosity and viscosity index., Flash and fire point, Cloud and pour point, Aniline point, acid value, saponification number, Steam Emulsion Number.
Solid lubricant-Graphite.
Greases as Semisolid lubricants - Consistency test and drop point test. Synthetic lubricants- silicones.
Criteria for selection of lubricants: IC engines, gears, refrigeration, transformer, steam turbines, delicate instruments. **(Contemporary Issues related to Topic)**

Unit VI: Polymeric Materials	**(7 Hrs.)**
Nanomaterials: Definition, Carbon Nanotubes and types. Applications of nanomaterials in electronics. Conducting Polymers: Intrinsic and extrinsic conducting polymers, doping, factors responsible for conduction. General properties and applications of conducting polymers. Liquid Crystal Polymers: Phases of LCP's, general properties and applications. Polymers in electronic industries: Piezo, pyroelectric, Ferroelectric polymers. Smart materials: Properties and applications of shape memory alloys, chromoactive, photoactive and magneto rheological materials. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 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/

MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/watch?v=dCimAH5IRSA
2.	https://www.youtube.com/watch?v=XTt3gXB0a84
3.	https://www.youtube.com/watch?v=5OxdXq91TV0
4.	https://www.youtube.com/watch?v=aoWBUhlN3-0
5.	https://www.youtube.com/watch?v=JfJ7MlP9Dco

II SEMESTER
22EL203 : Lab : Engineering Chemistry

Course Outcomes
Upon successful completion of the course the students will be able to
1. Illustrate qualitative and quantitative aspects of water for industrial and domestic applications. (L2)
2. Apply concepts of electrochemistry for energy storage devices. (L3)
3. Identify corrosion and discuss its prevention. (L2)
4. Establish insight into engineering materials. (L3)

Total 10 experiments are to be performed
(4 each from Phase I and Phase II and two demonstration experiments)

SN	Experiments based on
	List of Experiments-Phase I
1	Determination of total hardness of water sample.
2	Determination of alkalinity present in the water sample.
3	Estimation of Fe2+ ions by redox titration
4	Determination of copper by iodometric titration
5	Estimation of Nickel.
6	To determine the strength of a given potassium dichromate solution with N/20 sodium thiosulphate solution
7	Determination of COD of water sample.
8	Synthesis of polyaniline.
9	Determination of rate of the reaction of hydrolysis of ethyl acetate at room temperature and analysis of experimental data using Computational Software.
	List of Experiments-Phase II
1	Determination of viscosity of lubricating oil by Redwood Viscometer I or II
2	Determination of Cation exchange capacity of an ion exchange resin
3	Determination of molecular weight of a polymer.
4	Oil Testing for Flash Point / Cloud Point/Pour Point/Aniline Point
5	Proximate analysis of coal
6	Determination of surface tension of liquids using stalagmometer.
7	Determination of electrochemical equivalence of Copper using Faradays Law
8	To determine the heat of solution of potassium nitrate calorimetrically.
9	Determination of conductivity of water sample by conductivity meter.
10.	To verify Beer-Lambert law for KMnO4 and determine the concentration of the given solution of KMnO4

	List of Demonstration Experiments
1	Determination of pH of water sample by pH meter
2	Synthesis of urea formaldehyde resin.
3	Determination of consistency of grease sample by using penetrometer.
4	Determination of Drop Point of grease sample.

II SEMESTER
22EL204 : Professional Communication

Course Outcomes :

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

1. Apply different modes for effective communication.
2. Use competently phonology of English language.
3. Apply nuances of LSRW skills.
4. Communicate through different channels.

Unit I: Basics of Communication	**(7 Hrs.)**
Language as a tool of communication & characteristics of language Process of Communication, Levels of Communication, Flow of Communication, Networks of Communication, Classification of Barriers (Intrapersonal, Interpersonal, Organizational). **(Contemporary Issues related to Topic)**	
Unit II: English Phonetics	**(6 Hrs.)**
Speech Mechanism, Organs of speech, Consonant and Vowels sounds, Word stress rules. **(Contemporary Issues related to Topic)**	
Unit III: Presentation & Visual Communication	**(7 Hrs.)**
Presentation and audience analysis, Organizing content, Nuances of presentation, Visual Communication – Introduction & importance, Role & Psychology of color in visual communication. **(Contemporary Issues related to Topic)**	
Unit IV: Verbal Skills	**(7 Hrs.)**
Listening Skills -definition types and traits. Group Communication- (Purpose, Different types of Group Communication, Organizational GD, GD as a part of selection process), Meeting (purposes, preparation, procedure and minutes of meeting). **(Contemporary Issues related to Topic)**	
Unit V: Interview Skills	**(6 Hrs.)**
Purpose, expectations of employer and preparation for Interview, Types, Types of Questions & Answering Techniques, Telephonic Interviews – preparation and guidelines, Reading Techniques (Exercise based on Complex Unseen passages. **(Contemporary Issues related to Topic)**	
Unit VI: Technical Written Communication	**(6 Hrs.)**
Memo, Email, Report -Types, Characteristics, prewriting aspects of report and preparing writing aspects of report), Types of paragraphs. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

Textbooks:	
1.	Raman & Sharma, Technical Communication, Oxford University Press.
2.	T. Balasubramaniam, Textbook of English Phonetics for Indian Students, Macmillan India Ltd.

Reference Books:	
1.	Public Speaking, Dale Carnegie, How to Develop Self – Confidence & Influence People.
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-superior-vocabulary-e157841139.html
3	https://www.pdfdrive.com/improve-your-communication-skills-present-with-confidence-write-with-style-learn-skills-of-persuasion-e156963640.html
4	https://www.pdfdrive.com/21-days-of-effective-communication-everyday-habits-and-exercises-to-improve-your-communication-skills-and-social-intelligence-e158273760.html

II SEMESTER
22EL205 : 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**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Textbooks:	
1.	Nelson A., Engineering Mechanics (Statics and Dynamics), ed 2009, Tata Mc. Grew 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

II SEMESTER
22EL206 : 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,

II SEMESTER
22EL207 : Basic Electrical and Electronics Engineering

Course Outcomes :

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

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. Analyse analog Electrical Circuits for given application.
4. Analyze analog Electronic Circuits for given application.

Unit I: CIRCUIT ELEMENTS AND ENERGY SOURCES	**(7 Hrs.)**
Circuit Elements, Series and Parallel Combination of Resistances, Inductance and Capacitances, Energy Sources, Source Transformation, Sources with Periodic Waveforms, A.C. in Inductance and Capacitance, Star-Delta Connection. **(Contemporary Issues related to Topic)**	
Unit II: ANALYSIS OF NETWORK	**(7 Hrs.)**
Kirchhof's Laws, Current Division, Voltage Division, Nodal and Mesh Analysis of Electric Circuits, Superposition Theorem, Thevenin's Theorem. **(Contemporary Issues related to Topic)**	
Unit III: TRANSFORMER AND MOTORS	**(7 Hrs.)**
Introduction to Transformer, Construction, Working principle, Types of transformers, Introduction to DC Motor, Working Principle of DC Motor, Types of Motors. **(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, Configuration and its Characteristics. **(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. **(Contemporary Issues related to Topic)**	
Total Lecture	**42 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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 Learnin 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

II SEMESTER
22EL208 : Programming for Problem Solving

Course Outcomes :

On completion of this course, the student will be able to

1) Describe the basics of computer system components and operation, basics of algorithms and flowcharts (L2)
2) Develop programs using conditional statements and loops user defined functions, and pointers.(L3)
3) Analyze single and multi-dimensional arrays as a data structure and its use in problem solving.(L4)
4) Describe the basics of Strings, Structures, Unions, and File handling and its use for problem solving.(L2)

Unit I: Computer System Basics:	**(6 Hrs.)**
Introduction to components of a computer system (disks, memory, processor), how program is executed, understanding of concepts such as operating system, compilers, source and object programs, etc. Introduction to algorithms and flowcharts. **Basic building blocks of C:** Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, precedence of operators **(Contemporary Issues related to Topic)**	
Unit II:	**(6 Hrs.)**
Expressions, sizeof() operator, constants, typedef statement, basic input/output statements and functions (scanf, printf, getch, putch, gets, puts), Introduction to library functions, writing straight line programs.Decision control statements: if, if - else and nested if-else statements, else-if ladder statement, switch-case control statement. **(Contemporary Issues related to Topic)**	
Unit III: Loop Structures:	**(6 Hrs.)**
While, do while and for loops, break and continue statement, "goto" statement, real life programming examples based on these loop structures, bitwise operators, real life programming examples. **(Contemporary Issues related to Topic)**	
Unit IV: Modular programming:	**(7 Hrs.)**
Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value , C programs using functions, Recursive functions, comparing recursion against iteration, C programs using recursive functions, Concepts of a pointer, call by reference, types of programming errors, real life programming examples **(Contemporary Issues related to Topic)**	
Unit V: Arrays:	**(7 Hrs.)**
One dimensional array, array manipulation, insertion, deletion of an element, searching techniques- Linear and binary search, sorting techniques – Bubble sort , and selection sort. Two-dimensional arrays: matrix representation, programs for basic matrix operations such as addition, multiplication and transpose, Array as function arguments. Strings: string representation and string handling functions, real life programming examples **(Contemporary Issues related to Topic)**	
Unit VI: Structure and Union, Concepts of files:	**(7 Hrs.)**
Types of files, file opening in various modes, file opening and closing, fseek(), reading and writing text files, concept of pre-processor directives and macros, command line arguments, real life programming examples **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/27.c.pdf
2	http://103.152.199.179/YCCE/DTEL%20Material/7.Information%20Technology/DTEL%20PPTs/11.ITCP_E_SSG.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/106/104/106104128/

II SEMESTER
22EL209 : Lab : Programming for Problem Solving

Course Outcomes
Upon successful completion of the course the students will be able to
1) Describe the basics of computer system components and operation, basics of algorithms and flowcharts (L2)
2) Develop programs using conditional statements and loops user defined functions, and pointers.(L3)
3) Analyze single and multi-dimensional arrays as a data structure and its use in problem solving.(L4)
4) Describe the basics of Strings, Structures, Unions, and File handling and its use for problem solving.(L2)

SN	**Experiments based on**
1(A)	Introduction to Linux Operating system & it's different commands.
1(B)	Introduction to Vi editor, Compilation and Execution of a program in Linux.
2	Practical based on Arithmetic and Conditional operators.
3(A)	Practical based on Decision Control statements
3(B)	Practical based on Case Control statements (switch)
4	Practical based on Looping Statements. (for/while/do-while)
5	Practical based on Functions and Recursion.
6(A)	Practical based on 1-D Array. (Searching)
6(B)	Practical based on 1-D Array. (Sorting)
7	Practical based on 2-D Array.
8	Practical based on Strings
9	Practical based on Structures.
10	Practical based on Files.

II SEMESTER
Audit Course
GE2131: Universal Human Value

Course Outcomes
Upon successful completion of the course the students will be able to 1.Experiential validation through the way to verify right or wrong. 2. Practice living in harmony with natural acceptance. 3. Realize the importance of relationships**.** 4. Recognize the importance of sustainable co-existence in existence.

Unit I: Course Introduction Need, Basic Guidelines, Content and Process for Value Education	**(4 Hrs.)**
Understanding the need, basic guidelines, content and process for Value Education Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations	
Unit II: Understanding Harmony in the Human Being - Harmony in Myself!	**(4 Hrs.)**
Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I'	
Unit III: Understanding Harmony in the Family	**(4 Hrs.)**
Understanding Harmony in the family – the basic unit of human interaction Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship Understanding the meaning of Vishwas; Difference between intention and competence Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship	
Unit IV: Understanding Harmony in the Society-	**(4 Hrs.)**
Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and ,differentiation; the other salient values in relationship ,Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sahasttva as comprehensive Human Goals,Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhauma Vyavastha)- from family to world family! ,Practice Exercises and Case Studies will be taken up in Practice Sessions	

Unit V: Understanding Harmony in the Nature -	**(4Hrs)**
Whole existence as Co-existence, Understanding the harmony in the Nature Interconnectedness and mut Practice Exercises and Case Studies will be taken up in the Practice Sessions.ual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Practice Exercises and Case Studies will be taken up in the Practice Sessions.	
Unit VI :Understanding Harmony in the Existence -	**(4Hrs)**
Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence ,Practice Exercises and Case Studies will be taken up in the Practice Sessions.	
Total Lecture	**24 Hours**

Textbooks:	
1.	**The primary resource material for teaching this course consists of text book** A foundation course in Human Values and professional Ethics, Excel books, 1st Edition 2011, R.R Gaur, R Sangal, G P Bagaria

Reference Books:	
1.	**The teacher's manual** A foundation course in Human Values and professional Ethics, Excel books,1st Edition 2011, R.R Gaur, R Sangal, G P Bagaria

II SEMESTER

Audit Course

MLC2122: YCAP2 -Functional English

MLC2122 YCAP-II	**No of Evaluations**	**Result of successful completion of YCAP II shall be calculated based on the basis of evaluations.** **To pass the exam a students must score 50% marks**
Evaluation Scheme	EVAL-I	
	100 marks	

Objective	Objective
The aim of this course is to get the students to a common level in spoken English. The majority of the target group is expected to know English as a foreign/official language. Thus the objective of the course is to make the students comfortable in using it as a spoken language when the situation demands	Students will heighten their awareness of correct usage of English grammar in writing and speaking.

Syllabus Subject: Functional English – 2nd Sem , No. of hours - 20

Unit No.	Topic	Duration
1	Introduction to Functional English - 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	2 hours
2	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	2 hours
	Practice exercises, Practice Conversations, Script Activity	1.5 Hours
	Quiz on the above Topics, Exercises for Evaluation	0.5 Hours

Unit No.	Topic	Duration
3	Topic: Internet & Social Media Communication Introduction & Basics to Social Networking, Texting & Instant messaging, Blogs & Discussion Board- discussion with examples, Ethics of Social media & communication	3 Hours
	Topic: Introduction to Creative Ads Why Ads, Whats in it for me?, Characteristics of ads, Assignment	
4	Topic: Tenses -1 Introduction & Basics, Simple Tense (Past, Present, Future), Continuous Tense (Past, Present, Future) – discussion with examples	4 Hours
	Assignment Presentation on Mad Ads, Quiz on Tenses and Social Media-Internet Communication	

Unit No.	Topic	Duration
5	Topic: Tenses -2 Introduction & Basics, Perfect Tense (Past, Present, Future), Perfect Continuous Tense (Past, Present, Future) – discussion with examples	3.5 Hours
	Topic: Introduction to Movie Magic Learn English with films, Film Vocabulary, Describing a film, Types of Films,	
6	Topic: Written Communciation 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	3.5 Hours
	Assessment – Letter and Email Writing, Tenses - Quiz	

Reference Books:	
1.	Soft Skills and Professional Communication, Francis Peters SJ, Mcgraw Hill Education
2.	Bringing out the best in People, Aubrey Daniels, Mcgraw Hill

MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/channel/UCLsI5-B3rIr27hmKqE8hi4w
2.	https://www.youtube.com/channel/UC1Y1I4shF84scQ4HBThahcg

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

3rd 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)

SoE No. 22EL-101

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

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/HUM	22EL301	Integral Transforms and Partial differential Equations	T	3	0	0	3	3	30	20	50	3 Hrs
2	3	HS	EL/EL	22EL302	Electrical Energy Generation System	T	3	0	0	3	3	30	20	50	3 Hrs
3	3	PC	EL/EL	22EL303	**Lab**: Electrical Engineering Workshop	P	0	0	2	2	1		60	40	
4	3	PC	EL/EL	22EL304	Network Analysis	T	3	0	0	3	3	30	20	50	3 Hrs
5	3	PC	EL/EL	22EL305	**Lab**:Computer Programming	P	0	0	2	2	1		60	40	
6	3	PC	EL/EL	22EL306	Electrical Machines	T	3	1	0	3	3	30	20	50	3 Hrs
7	3	PC	EL/EL	22EL307	**Lab:**Electrical Machines	P	0	0	2	2	1		60	40	
8	3	PC	EL/EL	22EL308	Electrical Measurement & Instrumentation	T	3	0	0	3	3	30	20	50	3 Hrs
9	3	PC	EL/EL	22EL309	**Lab:** Electrical Measurement and Instrumentation	P	0	0	2	2	1		60	40	
10	3	PC	CV/EL	22EL310	Environmental Sustainability, Pollution and Management	**T**	3	0	0	3	3	30	20	50	3 Hrs
					TOTAL THIRD SEM		**18**	**1**	**8**	**26**	**22**				
Audit Courses															
1	3	HS	T&P	MLC2123	YCCE Communication Aptitude Preparation (YCAP3)	**A**	3	0	0	3	0				
2	3	BES	EL	MLC105	Introduction to C language	**A**	2	0	0	2	0				
FOURTH SEMESTER															
1	4	BS	EL/EL	22EL401	Signals and System	T	3	0	0	3	3	30	20	50	3 Hrs
2	4	PC	GE/GE	22EL402	Fundamentals of Management and Economics	T	3	0	0	3	3	30	20	50	3 Hrs
3	4	PC	EL/EL	22EL403	Electrical Machines in Power System	T	3	0	0	3	3	30	20	50	3 Hrs
4	4	PC	EL/EL	22EL404	**Lab:**Electrical Machines in Power System	P	0	0	2	2	1		60	40	
5	4	PC	EL/EL	22EL405	Fundamentals of Power System	T	3	0	0	3	3	30	20	50	3 Hrs
6	4	PC	EL/EL	22EL406	Embedded systems	T	3	0	0	3	3	30	20	50	3 Hrs
7	4	PC	EL/EL	22EL407	**Lab:** Embedded systems	P	0	0	2	2	1		60	40	
8	4	PC	EL/EL	22EL408	Fundamentals of Electrical Drives	T	3	1	0	3	3	30	20	50	3 Hrs
9	4	PC	EL/EL	22EL409	**Lab:** Fundamentals of Electrical Drives	P	0	0	2	2	1		60	40	
10	4	PC	EL/EL	22EL410	**Lab:** Renewable Energy Sources	P	0	0	2	2	1		60	40	
					TOTAL FOURTH SEM		**18**	**1**	**8**	**26**	**22**				
Audit Courses															
1	4	HS	T&P	MLC2124	YCCE Communication Aptitude Preparation (YCAP4)	**A**	3	0	0	3	0				
2	4	BES	EL	MLC106	Object Oriented Programming	**A**	2	0	0	2	0				

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

TA ** = for Theory : 12 marks on lecture quizzes, 12 marks on two TA2 activities decided by course teacher, 2 marks on class attendance and 4 marks on TA4 activities

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

		June 2022	1.00
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

III SEMESTER
22EL301 : Integral Transforms and Partial differential Equations

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:1	Laplace Transforms	6 Hours
Definition and examples of Laplace transforms, properties of Laplace transforms, Examples by using properties of Laplace transforms, Unit step function, periodic function. **Contemporary Issues related to Topic**		

Unit:2	Inverse of Laplace Transform	7 Hours
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. **Contemporary Issues related to Topic**		

Unit:3	Z-Transform	6 Hours
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. **Contemporary Issues related to Topic**		

Unit:4	Fourier Series	7 Hours
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. **Contemporary Issues related to Topic**		

Unit:5	Partial Differential Equation	7 Hours
Partial Differential Equations of first order and 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 :6	Fourier Transform	6 Hours
Definition of Fourier Integral Theorem, Fourier Transforms, Fourier sine and cosine integrals, Finite Fourier sine and cosine Transforms, Convolution Theorem**,** Parseval's Identity. **Contemporary Issues related to Topic**		
	Total Lecture Hours	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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

Reference Books	
1	Chandrika Prasad, Mathematics for Engineers, 19th Edition, John Wiley and Sons, INC.
2	L. A. Pipes and Harville, Applied Mathematics for Engineers, 3rd Edition, McGraw Hill.
3	P.N. and J. N. Wartikar, A text book of Applied MAthematics, 3rd edition, Pune Vidyarthi Griha Prakashan
4	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/Suported%20file/Supprted%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/

III SEMESTER
22EL302 : 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	6 Hours

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 curveload 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	7 Hours

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	6 Hours

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	7 Hours

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

			July 2022	1.00	Applicable for AY 2022-23 Onwards
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Unit:5	Thermal Power Station	6 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**	**7 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: **39 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	Ashfaque 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/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/

III SEMESTER
22EL303 : 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)

III SEMESTER
22EL304 : 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**	**6 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.**	**6 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.

Unit :6	Two Port Parameters	6 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	**39 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=JnNpdGU9ZWhvc3QtbGl2ZQ%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

III SEMESTER
22EL305 : 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

III SEMESTER
22EL306 : 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.

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 phase transformers, All day efficiency. Harmonics effect due to saturation.

Contemporary Issues related to Topic

Unit:2	D.C. Generator	7 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	6 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	7 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	6 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

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Unit :6	Special Machines	6 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	**39 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, Macmillon 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/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/108/105/108105155/

III SEMESTER
22EL307 : 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

III SEMESTER
22EL308 : 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**	**7 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**	**6 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

Unit:4	**Instrument Transformers**	**6 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.

Contemporary Issues related to Topic

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**	**6 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	**39 Hours**

Text books	
1	A.K.S`awhney,"Electrical Measurement And Instrumentation",1st edition,Dhanpat Rai Publications,2021

Reference Books	
1	R. K. Rajput,"Electrical Measurement And Instrumentation " 2nd edition,S. Chand & Company Ltd,2009
2	U. A. Bakshi,A.U. Bakshi,K.A Bakshi,"Electrical Measurement And Instrumentation ", 1st edition,Technical Publications,2008
3	J. B.Gupta,"A Course in Electrical & Electronics Measurement & Instrumentation ",1st edition,S K Kataria and Sons,2012

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-642-05166-1
2	http://link.springer.com/openurl?genre=book&isbn=978-3-319-05352-3

MOOCs Links and additional reading, learning, video material	
1	NPTEL: Electrical Measurement and Electronic Instruments

III SEMESTER
22EL309: 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.

III SEMESTER

22EL310 : 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, Natural Resources and Sustainable Development**	**6 Hours**
The man-environment interaction; Environmental Ethics and emergence of environmentalism; Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, water, soil and mineral resources, renewable, and non-renewable energy resources; Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs		
Unit:2	**Environmental Issues, Conservation of Biodiversity and Ecosystems**	**6 Hours**
Environmental issues and scales: Land use and Land cover change, Global change; Biodiversity and its distribution, Ecosystems and ecosystem services, Threats to biodiversity and ecosystems, National and international policies for conservation.		
Unit:3	**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 human health		
Unit:4	**Climate Change: Impacts, Adaptation and Mitigation**	**7 Hours**
Understanding climate change, Impacts, vulnerability and adaptation to climate change, Mitigation of climate change		
Unit:5	**Environmental Management**	**7 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 :6	**Environmental Treaties and Legislation**	**6 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	**39 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
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

III SEMESTER

MLC2123 : YCCE Communication Aptitude Preparation (YCAP3)

III SEMESTER

Audit Course

MLC105 : Introduction to C Programming

Course Outcomes:
Upon successful completion of the course the students will be able to 1) Write algorithms, flowcharts and programs. 2) Implement different programming constructs and decomposition of problems into functions. 3) Use and implement data structures like arrays and structures to obtain solutions. 4) Use of pointers with simple programming.

Unit:1	**Basics of C programming**	**4 Hours**
Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, precedence of operators, Input/output statements in C.		
Unit:2	**Conditional Branching**	**4 Hours**
Applying if and switch statements, nesting if and else, use of break and default with switch		
Unit:3	**Iteration and loops**	**4 Hours**
Use of while, do while and for loops, multiple loop variables, use of break and continue statements.		
Unit:4	**Functions**	**4 Hours**
Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.		
Unit:5	**Applications of arrays and introduction to strings**	**4 Hours**
Arrays Declaration, Initialization, One dimensional array, Two dimensional arrays, String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.		
Unit :6	**Pointers**	**4 Hours**
Concept of Pointers, Address operators, pointer type declaration, pointer assignment, pointer initialization pointer arithmetic, Indirection Operator, Pointers to Pointers, functions and pointers, Arrays and Pointers, pointer arrays. dynamic memory allocation, file managements.		
	Total	**24 Hours**

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

4th 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)

SoE No. 22EL-101

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

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/HUM	22EL301	Integral Transforms and Partial differential Equations	T	3	0	0	3	3	30	20	50	3 Hrs
2	3	HS	EL/EL	22EL302	Electrical Energy Generation System	T	3	0	0	3	3	30	20	50	3 Hrs
3	3	PC	EL/EL	22EL303	**Lab**: Electrical Engineering Workshop	P	0	0	2	2	1		60	40	
4	3	PC	EL/EL	22EL304	Network Analysis	T	3	0	0	3	3	30	20	50	3 Hrs
5	3	PC	EL/EL	22EL305	**Lab**:Computer Programming	P	0	0	2	2	1		60	40	
6	3	PC	EL/EL	22EL306	Electrical Machines	T	3	1	0	3	3	30	20	50	3 Hrs
7	3	PC	EL/EL	22EL307	**Lab:**Electrical Machines	P	0	0	2	2	1		60	40	
8	3	PC	EL/EL	22EL308	Electrical Measurement & Instrumentation	T	3	0	0	3	3	30	20	50	3 Hrs
9	3	PC	EL/EL	22EL309	**Lab:** Electrical Measurement and Instrumentation	P	0	0	2	2	1		60	40	
10	3	PC	CV/EL	22EL310	Environmental Sustainability, Pollution and Management	**T**	3	0	0	3	3	30	20	50	3 Hrs
					TOTAL THIRD SEM		**18**	**1**	**8**	**26**	**22**				
Audit Courses															
1	3	HS	T&P	MLC2123	YCCE Communication Aptitude Preparation (YCAP3)	**A**	3	0	0	3	0				
2	3	BES	EL	MLC105	Introduction to C language	**A**	2	0	0	2	0				
FOURTH SEMESTER															
1	4	BS	EL/EL	22EL401	Signals and System	T	3	0	0	3	3	30	20	50	3 Hrs
2	4	PC	GE/GE	22EL402	Fundamentals of Management and Economics	T	3	0	0	3	3	30	20	50	3 Hrs
3	4	PC	EL/EL	22EL403	Electrical Machines in Power System	T	3	0	0	3	3	30	20	50	3 Hrs
4	4	PC	EL/EL	22EL404	**Lab:**Electrical Machines in Power System	P	0	0	2	2	1		60	40	
5	4	PC	EL/EL	22EL405	Fundamentals of Power System	T	3	0	0	3	3	30	20	50	3 Hrs
6	4	PC	EL/EL	22EL406	Embedded systems	T	3	0	0	3	3	30	20	50	3 Hrs
7	4	PC	EL/EL	22EL407	**Lab:** Embedded systems	P	0	0	2	2	1		60	40	
8	4	PC	EL/EL	22EL408	Fundamentals of Electrical Drives	T	3	1	0	3	3	30	20	50	3 Hrs
9	4	PC	EL/EL	22EL409	**Lab:** Fundamentals of Electrical Drives	P	0	0	2	2	1		60	40	
10	4	PC	EL/EL	22EL410	**Lab:** Renewable Energy Sources	P	0	0	2	2	1		60	40	
					TOTAL FOURTH SEM		**18**	**1**	**8**	**26**	**22**				
Audit Courses															
1	4	HS	T&P	MLC2124	YCCE Communication Aptitude Preparation (YCAP4)	**A**	3	0	0	3	0				
2	4	BES	EL	MLC106	Object Oriented Programming	**A**	2	0	0	2	0				

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

TA ** = for Theory : 12 marks on lecture quizzes, 12 marks on two TA2 activities decided by course teacher, 2 marks on class attendance and 4 marks on TA4 activities

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

		June 2022	1.00
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

IV SEMESTER

22EL401 : Signals and System

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 signals in time and frequency domain using Fourier series and Fourier transform.
3. Analyze the given system in time domain and frequency domain to arrive at valid conclusion.
4. Evaluate various parameter using properties of transform techniques to solve the continuous and discrete Time Systems

Unit:1	**Continuous and Discrete time signals**	**7 Hours**

Signal representation, Transformation of the independent variable, classification of signals, Signal Energy and Power, Periodic, Even & Odd, Real and Exponential Signals

Contemporary Issues related to Topic

Unit:2	**Continuous and Discrete time System**	**6 Hours**

Continuous-Time Systems, system properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, convolution

Contemporary Issues related to Topic

Unit:3	**Fourier Series Representation of Periodic Signals**	**7 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.

Contemporary Issues related to Topic

Unit:4	**Fourier Transform**	**6 Hours**

Convergence of Fourier Transform and its Properties, Representation of Aperiodic Signals, The Fourier Transform for Periodic Signals. Analysis and Characterization of LTI Systems using the Fourier Transform.

Contemporary Issues related to Topic

Unit:5	**The Laplace Transform**	**7 Hours**

The Laplace Transform. The Region of Convergence for Laplace Transforms. The Inverse Laplace Transform. Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot. Properties of the Laplace Transform. System Function Algebra and Block Diagram Representations. The Unilateral Laplace Transform.

Contemporary Issues related to Topic

Unit :6	**The Z-Transform**	**Hours 6**

The 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. System Function Algebra and Block Diagram Representations. The Unilateral z-Transform.

Contemporary Issues related to Topic

	Total Lecture Hours	**39 Hours**

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

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

IV SEMESTER
22EL402 : Fundamentals of Management and Economics

Course Outcomes:

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

1. Explain the Functions of Management and identify tools and techniques of Marketing of goods and services
2. Analyze the role of Financial Accountancy and 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:1	Principles of Management	6 Hours

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

Contemporary Issues related to Topic

Unit:2	Marketing Management	6 Hours

Marketing Management - Definition & scope, Selling & Modern Concepts of Marketing, Market Research, Customer Behaviors, Product Launching, Sales Promotion, Pricing, Channels of Distribution, Advertising, Market Segmentation, Marketing Mix, Positioning, Targeting

Contemporary Issues related to Topic

Unit:3	Financial Accountancy and Management	7 Hours

Definition & Functions of Finance department, Sources of finance, Types of capital, Types of Taxes, Introduction of Accountancy and its rules, Preparation of Books of Account- Jounal, Posting of transaction into ledger and preparation of trial balance, Introduction of trading account, profit and loss account and balance sheet

Contemporary Issues related to Topic

Unit:4	Introduction to Economics and engineering Economy:	6 Hours

Economics and engineering economy, Utility analysis- Cardinal, ordinal, Law of diminishing marginal utility, Laws of demand and supply, elasticity of demand, its measurement and application.

Contemporary Issues related to Topic

Unit:5	Engineering Production and Costs	7 Hours

Factors of Production: Land, Labour, Capital, Enterprise and their peculiarities, Concepts and types of costs, Law of Variable proportions (Law of diminishing marginal returns) and Return to Scale (Increasing, constant and decreasing), Economies and diseconomies of scale. Inflation: Meaning, types, causes and consequences, measures to control inflation, Concepts of deflation and Stagflation.

Contemporary Issues related to Topic

Unit :6	Market structures - equilibrium output and price	7 Hours
Forms of market structures: Perfect competition, monopolistic competition, oligopoly, duopoly and monopoly, Demand and revenue curves for firm and industry in various forms of market structure, Total, average and marginal revenue curves, equilibrium of firms and industries under various forms of market structures, Price discrimination. **Contemporary Issues related to Topic**		
	Total Lecture Hours	**39 Hours**

Textbooks	
1.	Principle of Management, 9th edition , Harold Koontz Ramchandra, Tata McGrow hills
2.	Marketing Management: Planning, Implementation and Control, 3rd Edition, Ramaswamy V.S. and Namakumari S, Macmillian
3.	Financial Services, 19th Edition, Khan M Y, Tata McGraw Hill, 19
4.	Modern Economics, 13th Edition, H. L. Ahuja, S. Chand Publisher, 2009
5.	Modern Economic Theory, 3rd edition, K. K. Devett, S. Chand Publisher,2007
6.	Principle of Economics, 7th edition, Mankiw N. Gregory, Thomson, 2013

Reference Books	
1.	Foundations of Financial Markets and Institutions, 3rd Edition, Fabozzi, Pretice Hall
2.	Fundamentals of Financial Instruments , 2nd Edition, Parameshwaran, Wiley India
3.	Marketing Management , 3rd Edition , RajanSaxena, Tata McGraw Hill
4.	Advance Economic Theory, 17th Edition, H. L. Ahuja**,** S. Chand Publisher, 2009
5.	International Trade, 12th edition, M. L. Zingan, Vindra Publication, 2007
6.	Macro Economics, 11th edition, M. L. Zingan, Vindra Publication, 2007
7.	Monitory Economics:, 1st Edition, M. L. Sheth, Himayalaya Publisher, 1995
8.	Economics of Development and Planning, 12th edition, S. K. Misra and V. K. Puri, Himalaya Publishing House, 2006.

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://nptel.ac.in/
3	https://onlinecourses.nptel.ac.in/noc20_mg31/preview
4	https://onlinecourses.nptel.ac.in/noc21_hs52/preview
5	https://onlinecourses.nptel.ac.in/noc22_hs67/preview

IV SEMESTER
22EL403 : 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	6 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**	**7 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**	**6 Hours**
Conditions of synchronization of generator with another generator and or Infinite busbars, Parallel operation, Load sharing between parallel connected generators. Effect of variable excitation and power input (speed) on generator operation **Contemporary Issues related to Topic**		
Unit:4	**Synchronous Motor**	**6 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 for electrical and electromechanical power developed, losses and efficiency in synchronous machines. **Contemporary Issues related to Topic**		
Unit :6	**Transient Behaviour**	**7 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	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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/

IV SEMESTER

22EL404 : Lab.: Electrical Machines in Power System

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

IV SEMESTER
22EL405 : 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**	**6 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, Numericals, Basics of The Electricity Act 2003 **Contemporary Issues related to Topic**		
Unit:2	**Inductance of Transmission Line**	**6 Hours**
Constants of transmission line, flux linkages, inductance of single phase two wire line, inductance of 3 phase overhead line, self GMD and mutual GMD, Numericals **Contemporary Issues related to Topic**		
Unit:3	**Capacitance of Transmission Line**	**6 Hours**
Electric Potential, Capacitance of single phase 2 wire line, capacitance of 3 phase overhead line, Symmetrical and unsymmetrical spacing, Numericals. **Contemporary Issues related to Topic**		
Unit:4	**Distribution system and Load flow analysis**	**7 Hours**
Types of distribution system, comparison, Feeders and distributors, Numericals on DC and AC distribution , Y Bus formation, Illustration of active and reactive power transmission, Introduction to load flow studies . **Contemporary Issues related to Topic**		
Unit:5	**Insulators and Cables**	**7 Hours**
Types, Potential distribution over suspension insulator string, String efficiency, Numericals on string efficiency. CABLES: Construction, classification, insulation resistance, capacitance, Dielectric stress, economical size, Grading of cables, Numericals. **Contemporary Issues related to Topic**		
Unit :6	**Transmission Systems**	**7 Hours**
Short, medium (Nominal T and Nominal Π method) and Long line, Voltage regulation & efficiency of power transmission lines using simple series equivalent representation, ABCD parameters of transmission lines. **Contemporary Issues related to Topic**		
	Total Lecture Hours	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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)

IV SEMESTER
22EL406 : Embedded systems

Course Outcomes:

Upon successful completion of the course the students will be able

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	6 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.

Contemporary Issues related to Topic

Unit:2	Microcontroller Integrated Development Environment (IDE)	7 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.

Contemporary Issues related to Topic

Unit:3	Peripheral Interfaces-1	6 Hours

I/O programming, Interfacing with simple switch, LED. 8 bit and 16 bit Timers, various modes of operations of timers, Counters, PWM programming.

Contemporary Issues related to Topic

Unit:4	Peripheral Interfaces-2	6 Hours

Interrupt structure, Interrupt priority, Interrupt programming. Analog to Digital Converter, UART programming, RS232, RS 485 transceivers, I/O expansion techniques, Memory expansion

Contemporary Issues related to Topic

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.

Contemporary Issues related to Topic

Unit :6	Introduction to Other Advanced Microcontrollers	7 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

Contemporary Issues related to Topic

	Total Lecture Hours	39 Hours

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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, 2nd 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

IV SEMESTER
22EL407 : Lab. Embedded systems

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

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

IV SEMESTER

22EL408 : Fundamentals of Electrical Drives

Course Outcomes:

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

1. Explain the speed-torque characteristics, starting, braking and control of different motors and to select the motor drive for various applications.
2. Identify the size of motor for suitable drive application and motor torque in flywheel effect.
3. Analyze PLC Ladder programming to control Electrical drives.
4. Describe analog and digital speed controls for electrical drives.

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.

Contemporary Issues related to Topic

Unit:2	Selection of motors	6 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.

Contemporary Issues related to Topic

Unit:3	AC and DC contactor	6 Hours

Analyze ,Categorize AC DC Contactor,limit switch ,working,applications,Control circuit by using contactors

Contemporary Issues related to Topic

Unit:4	Programmable Logic Controllers	7 Hours

Programmable Logic Controllers (PLC), programming methods, Ladder programming with few examples, Applications of PLC's in electrical drives.

Contemporary Issues related to Topic

Unit:5	Traction motors	6 Hours

Traction motors: Motors use in AC/DC traction and their performance and desirable characteristics, requirement and suitability of motor for traction duty, Speed time characteristics of train, Traction motor control. Series parallel control with numerical method, Starting and braking of traction motor

Contemporary Issues related to Topic

Unit :6	Digital speed control of Electric motors	7 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 (DSP's) for drive control.Variable Frequency Drive(VFD)

Contemporary Issues related to Topic

	Total Lecture Hours	39 Hours

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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,2nd - 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 CompanyPublication

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-642-25904-3

MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/JZ6f_i4ao6Y
2	https://youtu.be/1AT1yuQ9awM
3	https://youtu.be/zWvcM-4aUgg

IV SEMESTER
22EL409 : Lab. Fundamentals of Electrical Drives

Course Outcomes:

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

1. Explain the speed-torque characteristics ,starting,braking and control of different motors and to select the motor drive for various applications.
2. Identify the size of motor for suitable drive application and motor torque in flywheel effect.
3. Analyze PLC Ladder programming to control electrical drives.
4. Categorize analog and digital speed controls for electrical drives.

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

Sr. No.	Experiments based on
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

IV SEMESTER
22EL410 : 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

IV SEMESTER

MLC2124 : YCCE Communication Aptitude Preparation (YCAP4)

IV SEMESTER
Audit Course
MLC106 : Object Oriented Programming

Unit:1	**Object Oriented Programming**	**6 Hours**
Object oriented programming - Traditional approach versus object oriented approach. Characteristics of object-oriented languages - Basic program construction - output using count - Preprocessor directives - variables - Input with Cin - Manipulators - Type conversion.		
Unit:2	**Control Statements**	**6 Hours**
Arithmetic and Relational Operators - Library functions. Loops: for, while, do - Decisions: if, if...else - else. if construction - switch statement - Logical operators Control statements.		
Unit:3	**Structures and Functions**	**6 Hours**
Structures - Enumerated data types - Simple functions - Passing arguments to functions Returning values from functions - Reference arguments - Overload -functions - Inline functions - Default arguments.		
Unit:4	**Classes**	**6 Hours**
Variables and storage classes - Returning by reference, a simple class - C++ objects as physical objects. C++ object as data types - Constructors and destructors - Object as function arguments, - Returning objects from functions Structures and classes - Classes, objects, and memory-static class data.		
Unit:5	**Arrays Overloading**	**6 Hours**
Array fundamentals - Arrays as class member data - Arrays of objects- Strings overloading unary operators - Overloading binary operators -Data conversion - Pitfalls of operator overloading and conversion, Overloading binary operator using friends.		
Unit :6	**Inheritance**	**6 Hours**
Inheritance - Derived class and base class - Derived class, constructors - Overriding member functions. Class hierarchies - Public and private inheritance - levels of inheritance - Multiple inheritance - Ambiguity in multiple inheritance - Containership classes within classes - Inheritance and program development.		
		Total **24 Hour**

Text books	
1	Let us "C++" Y.P. Kanetkar

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

5th 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)

SoE No. 22EL-101

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

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	22EL501	Control System	T	3	0	0	3	3	30	20	50	3 Hrs
2	5	PC	EL	22EL502	Lab: Control System	P	0	0	2	2	1		60	40	
3	5	PC	EL	22EL503	Power Electronics	T	3	0	0	3	3	30	20	50	3 Hrs
4	5	PC	EL	22EL504	**Lab:** Power Electronics	P	0	0	1	2	1		60	40	
5	5	PC	EL	22EL505	**Lab:** Electronic Engineering Workshop	P	0	0	1	2	1		60	40	
6	5	PE	EL		**Professional Elective -I ***	T	3	0	0	3	3	30	20	50	3 Hrs
7	5	PE	EL		**Professional Elective -II****	T	3	0	0	3	3	30	20	50	3 Hrs
8	5	STR	EL	22EL506	Industrial Training, Seminar and Report	P	0	0	1	1	1		60	40	
9	5	OE	EL		**Open Elective - I**	T	3	0	0	3	3	30	20	50	3 Hrs
10	5	OE	EL		**Open Elective - II**	T	3	0	0	3	3		60	40	
					TOTAL FIFTH SEM		**18**	**0**	**5**	**25**	**22**				

List of Lab. Professional Electives-I *

1	5	PE-I	EL	22EL511	PEI: Electric and Magnetic Field
2	5	PE-I	EL	22EL512	PEI: Electrical Machine Design
3	5	PE-I	EL	22EL513	PEI: Design of Photovoltaic System
4	5	PE-I	EL	22EL514	PEI: Electric Power Utilization

List of Lab. Professional Electives-II **

1	5	PE-I	EL	22EL531	PEII:Illumination Engineering(MOOC)
2	5	PE-I	EL	22EL532	PEII:Energy Storage System
3	5	PE-I	EL	22EL533	PEII:Electrical Wiring :Estimation and Costing
4	5	PE-I	EL	22EL534	PEII:Distributed Generations in Power System

Open Elective-I

1	5	OE-I	EL	22EL551	OEI:Renewable Energy Generation System
2	5	OE-I	EL	22EL552	OEI:Electrical Machines and their Applications
3	5	OE-I	EL	22EL553	OEI:Solar Power Plant Design and Installation

Open Elective-II

1	5	OE-II	EL	22EL571	OEII:Electrical Energy Audit and Safety
2	5	OE-II	EL	22EL572	OEII:Utilization of Electrical Energy
3	5	OE-II	EL	22EL573	OEII:Power System Engineering

Audit Courses

1	5	HS	T&P	MLC2125	YCAP5: YCCE Communication Aptitude Preparation	A	3	0	0	3	0	
2	5	HS	R&D	MLC125	Design thinking	A	2	0	0	2	0	

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

TA ** = for Theory : 12 marks on lecture quizzes & TA2 activities decided by course teacher, 2 marks on class attendance and 4 marks on TA4 activities

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

		June 2022	1.00
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

V SEMESTER
22EL501: Control System

Course Outcomes:

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

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

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 system such as – electrical, mechanical, electro-mechanical, thermal, hydraulic, pneumatic etc., Analogous systems.

Unit:2	Characteristics of Feedback Control Systems	6 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		7 Hours

Time Domain Analysis of Control Systems: 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	6 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	7 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**	**6 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	**39 Hours**

Text books				
1	Control system Engineering	5th Edition	I. J. Nagrath & M. Gopal	New Age nternational
2	Automatic control systems	7th Edition	B. C. Kuo	PHI Learning Private Limited
Reference Books				
1	Control Systems	1st Edition	Ashok Kumar	McGraw - Hill
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/Suported%20file/Supprted%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			

V SEMESTER
22EL502: Lab: Control System

Course Outcomes:

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

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

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

Sr. No.	Experiments based on
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 a) To plot the characteristic of synchro transmitter. b) To plot the characteristic 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 Effect of Type of System on Steady State Error
12	PID Controller

V SEMESTER
22EL503: Power Electronics

Course Outcomes:
Upon successful completion of the course the students will be able to 1. **Identify** power semiconductor devices and their use in power converters 2. **Describe** Power semiconductor devices with their turn on/off methods and converter circuits 3. **Determine** the different parameters of commutation, protection of power devices and converter circuits 4. **Analyze** the performance of converters, chopper and inverter

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**	**6 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, cycloconverter (single phase)		
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**	**6 Hours**
Characteristic and working of MOSFET, Gate turn off thyristor and insulatedgate bipolar transistor. protection of SCR: gate circuit protection, over voltage and over currentprotection, 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.		
Unit :6	**Single Phase and Three Phase Bridge Inverters**	**6 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	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Text books	
1	Power Electronics Circuit"s Devices and Applications, 3rd Edition,2004, M.H.Rashid, Prentice Hall Limited
2.	Power Electronics, D.Y.Shingare, Electrotech Publication Engineering Series
Reference books:	
1	Power Electronics, 1981, C.W.Lander, McGraw Hill
2.	Thyristors Applications and their, 2nd Edition 2002, Dr.M.Ramamoorty, East West Press
3.	Thyristors and their Applications, Dr.G.K.Dubey, Doralda Sinha and Joshi, New Age International
4.	Power Electronics, 1989, Ned Mohan, T.M.Undeland, and W.P.Robbins, John Wiley and Sons

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%20Electronics/Muhammad%20H.%20Rashid-Power%20electronics%20_%20devices,%20circuits,%20and%20applications-Pearson%20(2014).pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%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

V SEMESTER
22EL504: Lab: Power Electronics

Course Outcomes:
Upon successful completion of the course the students will be able to 1. **Identify** power semiconductor devices and their use in power converters 2. **Describe** Power semiconductor devices with their turn on/off methods and converter circuits 3. **Determine** the different parameters of commutation, protection of power devices and converter circuits **4. Analyse** the performance of converters, chopper and inverter

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

Sr. No.	Experiments based on
1	V-I characteristics of SCR and measurement of holding and latching current of SCR.
2	Four modes operation of TRIAC
3	Analysis of Buck DC/DC converter
4	Study and analysis of single-phase half wave rectifier with Resistive load.
5	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.

V SEMESTER
22EL505: Lab: Electronics Engineering Workshop

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Explain the basics of electronic hardware system and to identify the active and passive electronic components.
2. Build hands-on training with familiarization, identification, testing, assembling, and dismantling of various components like resistors, capacitors, transistors, UJT, JFET, different IC's, etc. using analog and digital meters.
3. Design various systems and develop PCB fabrication skills making use of the various tools and instruments available in the Electronics Engineering Workshop.
4. Make use of Software skills for designing PCB using various tools available in the Electronics Engineering Workshop.

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

Sr. No.	Experiments based on
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 transistors
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

V SEMESTER
22EL511: PE I: Electric and Magnetic Field

Course Outcomes:
Upon successful completion of the course the students will be able to
1 Apply vector calculus to understand the behavior of static electric fields and static magnetic fields in standard configurations.
2. Apply the Maxwell's equation relating to the electric and magnetic fields and the applications in electrostatics field.
3. To discriminate the symmetrical and unsymmetrical nature of the problem and the ability to solve the problems based on boundary conditions in electric and magnetic field.
4. Analyze electromagnetic wave propagation in free-space.

Unit:1	**Vector Analysis**	**7 Hours**
Scalars and vectors, vector algebra, the Cartesian coordinate system , the scalar and vector field, the dot product, thecross product, Cylindrical coordinate system, Spherical coordinate system		
Unit:2	**Coulomb's Law and Electric Field Intensity; Electric Flux Density, Gauss's Law, and Divergence**	**6 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**	**6 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,		

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**	**6 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	**39 Hours**

Text Books:

SN	Title	Edition	Authors	Publisher
1	Engineering Electromagnetics	7th Edition	W.H. Hayt J. A. Buck	McGraw Hill Publication.
2	Schaum"s Outline Series Theory and Problems of Electromagnetics	2nd Edition	Joseph A. Edminister	Schaum"s outline Series of Engineering
3	Principles of Electromagnetics	4th-2007	Matthew N.O.Sadiku	Oxford University Press

Reference books:

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/pGdr9WLto4A
2	https://youtu.be/0A45kt2U3U8
3	https://youtu.be/whv_d-fBCg0
4	https://youtu.be/whv_d-fBCg0

V SEMESTER
22EL512: 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 construction of electrical machines and find their rating and performance
2. Determine the design parameters of 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. andshort time of machines, Heating and cooling characteristics		
Unit:2	**Transformer design : Main Dimensions**	**6 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**	**6 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 ofend 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**	**6 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	**39 Hours**

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

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/Electrical%20Machines/Electrical%20Machinery%20by%20Dr.%20P%20S%20Bimbhra.pdf
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/fgKE6FWdLXU?feature=shared
2	https://youtu.be/fgKE6FWdLXU?feature=shared

V SEMESTER
22EL513: 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) To select the Mounting, grounding, positioning and installing the photovoltaic system. 3) Examine the performance, operation and maintenance of solar photovoltaic system, 4) Estimation and Design of solar PV Plant with inclusion of costing and safety parameters.

Unit:1	**Solar Photovoltaic Fundamentals**	**7 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**	**6 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**	**7 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**	**6 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**	**7 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**	**6 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	**39 Hours**

Text Books:				
Sr	**Title**	**Edition**	**Author**	**Publisher**
1	Solar photovoltaics : fundamentals, technologies and applications	2nd	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/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Renewable%20Energy%20Sources/B.H.Khan%20Book%20RES.pdf
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1	https://youtu.be/hr2sId412zU?feature=shared
2	https://youtu.be/XYbdPiplbp8?feature=shared
3	https://youtu.be/zQbPzKU4gW8?feature=shared

V SEMESTER
22EL514: PE I: Electric Power Utilization

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Identify utilization of electrical power with respect to heating and welding
2. Illustrate illumination from technical point of view
3. Explain different refrigeration systems for various application
4. Evaluate 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**	**6 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**	**6 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.		

Unit :6	**Compressors and DG Sets**	**6 Hours**
Compressors: Compressor types, Compressor efficiency, Compressed air system components. Diesel Generating Systems: Introduction, selection and installation factors, operational factors, energy performanceassessment in DG sets, energy saving measures for DG sets.		
	Total Lecture Hours	**39 Hours**

Text books:

S.No	Title	Edition	Author	Publisher
1	Utilization of Electric Energy		E. Openshaw Taylor	Orient Longman
2	Utilization of Electric Power & Electric Traction		J.B. Gupta	Kataria & Sons
3	Art and Science of Utilization of Electrical Energy		H Partap	Dhanpat Rai & Sons, Delhi
4	Utilisation of Electrical power	St 1 Edition, 2006	R. K. Rajput	Laxmi Publications Pvt. Ltd.

Reference books:

S.No	Title	Edition	Author	Publisher
1	Guide book for National Certification Examination for Energy Managers and Energy Auditors			Bureau of Energy Efficiency
2	Utilization of Electrical Power		Dr N. V. Suryanarayana	Wiley Eastern Ltd, New Age International

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1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/Power%20System%20Engineering/Power-plant-engineering-pk-nag1.pdf

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/fQrZMMWo1mA

V SEMESTER
22EL531: PE II: Illumination Engineering

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.

Unit:1		**7 Hours**
Radiation & Colour , ,Eye & Vision ,Different entities of illuminating systems		
Unit:2		**6 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		**6 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		**6 Hours**
Different type of loads and their individual protections Selection of cable/wire sizes; potential sources of fire hazards and precautions. Emergency supply stand by& UPS A specific design problem on this aspect		
	Total Lecture Hours	**39 Hours**

MOOCs Links and additional reading, learning, video material
https://youtu.be/kAmb5cut_VA?feature=shared
https://youtu.be/dQUvbbItNtU?feature=shared

V SEMESTER
22EL532: PE II: Energy Storage System and Management

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Describe the functions of energy storages, their sizing, and applications. 2. Explain electrochemical and mechanical energy storage. 3. Analyse the function and use of flywheel, fuel cells and hydrogen storage. 4. Illustrate battery hybridization, recycling, battery management systems, chargers, testing and mobile storage

Unit:1	**Introduction to energy storage**	**7 Hours**
Necessity of energy storage, different types of energy storage, mechanical, chemical, electrical, electrochemical, biological, magnetic, electromagnetic, thermal, comparison of energy storage technologies.		
Unit:2	**Electrochemical Energy Storage**	**6 Hours**
Supercapacitors, batteries, superconducting magnetic energy storage (SMES), mobile Vs stationary energy storage		
Unit:3	**Mechanical Energy Storage**	**7 Hours**
Introduction, Potential Energy Storage, Pumped hydro, Compressed Air Energy Storage (CAES), Flywheel Energy Storage (FES), Thermal Energy Storage – Sensible Heat and latent heat.		
Unit:4	**Hydrogen Storage and Fuel Cells**	**6 Hours**
Introduction, fuel-cells, Thermodynamic model of Fuel Cell, Enthalpy and Entropy of Fuel cells, thermodynamic efficiency, production of hydrogen – steam reforming process, electrolytic production of Hydrogen, Thermal decomposition of water and chemical extraction, Governmental promotion policy for hydrogen, On board Hydrogen storage systems: - Gaseous hydrogen, liquid hydrogen, metal hydride method.		
Unit:5	**Battery hybridization and mobile storage**	**7 Hours**
Types of Electric Vehicles (EV), components of EV, charging schemes for EV, Factors affecting EV, battery hybridization, battery pack design of EV, hybrid system for energy storage.		
Unit :6	**Energy Management Systems electric vehicle**	**6 Hours**
Technology and economic aspects of battery recycling, its applications, Battery management systems and controls, codes and standards, safety of high voltage devices. Battery charging and methods of Battery testing,Thermal management,Numericals		
	Total Lecture Hours	**39 Hours**

Text Books:				
SN	**Title**	**Edition**	**Author**	**Publisher**
1	Energy Storage - Technologies and Applications	2013	Ahmed Faheem Zobaa	InTech.
2	Fundamentals of Energy Storage	2017	J. Jensen and B. Sorenson	Wiley, New York
3	Chemical and Electrochemical Energy System	1998	R. Narayan and B. Viswanathan	University Press
4	Thermal energy storage: Systems and Applications	2010	Dincer I. and Rosen M. A.	Wiley, New York
5	Compressed air energy storage	2008	F. P. Miller, A. F. Vandome, M. B. John	VDM publishing
6	Fuel cell Fundamentals	2016	R. O'Hayre, S. Cha, W. Colella and F. B. Prinz	Wiley, New York
Reference Books:				
SN	**Title**	**Edition**	**Author**	**Publisher**
1	Energy Storage: Fundamentals, Materials and Applications	2015	Huggins R. A.	Springer
2	Battery Systems Engineering	2012	C. D. Rahn and C. Wang,	Wiley, New York
3	Handbook of Battery Materials	2011	C. Daniel, J. O. Besenhard	Wiley VCH Verlag GmbH & Co. KgaA

V SEMESTER
22EL533: PEII: Electrical Wiring: Estimation and Costing

Course Outcomes:

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

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

Unit:1	Estimating and Costing and Electrical Symbol	7 Hours

Introduction, Estimating, Various steps to form an Estimate, Purpose of Estimating and Costing, Quantities of a Good Estimator, Essential Elements of Estimating and Costing, Price list and Net Prices, Purchase Organisation, Tender and Tender Notice, Modes of Tendering with practical example, Availability and Opening of Tender form, Quotation, SI Units and Conventional Electrical Symbol,Guideline Codes

Unit:2	Electrical Power System Design	6 Hours

Substation : Introduction, Development and Classification of substation, Types of Substation, Design of substation, Main Connection Scheme, Substation auxiliaries supply, Complete Bus bar arrangements, Ring main system, Circuit breakers, Essential components of a circuit breaker, Connection diagram

Transmission and Distribution of Electrical Energy and House Service Connection : Introduction to Transmission system, Various definitions, DC and AC systems of supply, Distribution of Electrical Energy, Overhead lines, Types of Conductors, Line supports, Arrangement of Conductors, Distribution and Distribution lines, Insulators : Material s and types, Earthing of overhead line, Service lines

Unit:3	Underground Cables and Earth Resistance	7 Hours

Introduction; Cable Insulation; Material Used for Different Class of Insulating Materials; Characteristics of Some Insulating Materials in Cables; Different Types of Cables and their Applications ; Requirements of the Cables; Location of Line and Cable Fault and Earthing (Grounding)
Measurement of Earth Resistance; Direct measurement of Earth Resistance; Testing of Installations

Unit:4	Estimates for Internal Wiring H.T. & LT. Overhead Lines and Under Ground Cables , Service Lines	6 Hours

Estimating; Price Catalogue; Schedule of Labour Rates; Schedule of Rates and Estimating Data; Determination of Conductor Size; Current Carrying Capacity; Voltage Drop; Minimum Permissible Size; Conductor Size Calculation for Internal Domestic Wiring; Conductor Size Calculation for Underground Cable; Conductor Size Calculations for Overhead Lines with A.C.S.R., Introduction ; Service Line; Overhead Service Mains; Underground Service Main

Unit:5	Estimating and Costing of Material in Electrical Installation for Residential Buildings, Workshops and Halls	7 Hours

Introduction; Procedure while Estimating for Internal Electrification; Points to be Adhered while Preparing the Estimate; Power Wiring Installations; Types of Industrial Wiring

Unit :6	Estimates For L.T. Distributors and 11 K.V. Feeders and Substations	6 Hours
Estimates for L.T. Distributors and Street Light Feeders; Estimates for 11 K.V. Feeders and Substations; Extracts from Indian Electricity Amendment Rules-1972; Indian Standard (L.S.) Fundamental Definitions;		
	Total Lecture Hours	**39 Hours**

Text books	
1	Electrical Wiring Estimating and Costing ; Dr. S.L. Uppal and G.C. Garg ; Khanna Publisher
2	A Course in Electrical Installation Estimating and Costing ; J.B. Gupta ; S K Kataria Sons Publisher
Reference Books	
1	Electrical Wiring Estimating and Costing ; Dr. S.L. Uppal and G.C. Garg
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/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/2lDQh9HWsJQ?feature=shared

V SEMESTER
22EL534: PE II: Distributed Generation in Power System

Course Outcomes:
Upon successful completion of the course the students will be able to (1) Understand the principles of conversion ofrenewable and distributed energy sources (2) model Photovoltaic and wind turbine systems and different renewable energies (3) possess basic understanding of energystorage devices and energy system management (4) understand concepts of the power quality of smart grid

Unit:1	**Introduction to Distributed generations system**	**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**	**6 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**	**6 Hours**
Introduction, Necessity of energy storage, specifications of energy storage, energy storage methos: 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		
Unit :6	**Power Quality of Smart grid**	**6 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	**39 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, video material	
1	https://youtu.be/ui5zOmAX3cc
2	https://youtu.be/DlGSGJISxUI

V SEMESTER
22EL551: OE I: Renewable Energy Generation System

Course Outcomes:

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

1. Discuss types of renewable energy sources, outline as per Global and Indian context
2. Explain various applications of Solar energy sources and classify types of wind turbine generator
3. Classify geothermal and biomass energy
4. Compare energy from ocean, tide, wave and hydro for power generation, storage methods for renewable energy sources

Unit:1	**Introduction**	**7 Hours**
Fundamentals of Renewable / Non-renewable Energy Sources, Renewable Energy sources, Renewable Energy Potential in India, Renewable Energy Sources and their sustainable development. Storage methods for renewable energy sources.		
Unit:2	**Solar Energy**	**6 Hours**
Principles, scope and applications, solar radiation, its measurement & prediction, flat plate collectors-design & theory, solar water heating, solar dryers, solar stills, solar cooling and refrigeration. Solar cells, thermal storage, street lighting, solar power generation.		
Unit:3	**Wind Energy**	**7 Hours**
Introduction, Historical development, Wind energy resources, sites identification, blade element theory, aero-foil design, component of wind energy conversion system, wind turbine generator classification, and windmill and wind electrical generator, Advantages, disadvantages, economics and present status of wind energy generation systems, grid connection of wind energy		
Unit:4	**Geothermal Energy and Biomass Energy**	**6 Hours**
Introduction, history of geothermal resources, basics of geological process, dry rock and hot aquifer analysis, geothermal exploration, geothermal well drilling and fluid extraction, utilization of geothermal resources, geothermal heat pump, site of geothermal energy in India. Biomass energy resources and conversion processes, urban waste to energy conversion.		
Unit:5	**Mini & Micro hydro-plants**	**7 Hours**
Introduction, Classification of water turbines, hydroelectric system, essential components of hydroelectric system, system efficiency, advantages and disadvantages of hydroelectric system, present Indian power scenario of mini- micro hydro.		
Unit :6	**Ocean Energy**	**6 Hours**
Ocean thermal energy conversion (OTEC), Open cycle and closed cycle OTEC, Ocean wave energy conversion, tidal energy conversion. Introduction of Fuel cells		
	Total Lecture Hours	**39 Hours**

Text Books				
S.N	**TITLE**	**EDITION**	**AUTHOR**	**PUBLICATION**
1	Non Conventional Sources of Energy	**4th edition**	G.D.Rai	Khanna Publisher
2	Energy Technology:Nonconventional Renewable and Conventional		S. Rao and B.BParulekar	Khanna Publisher New Delhi

Reference books				
S.N	**TITLE**	**EDITION**	**AUTHOR**	**PUBLICATION**
1	Solar Energy : Principles of Thermal collection and storage	**3rd edition,1994**	S.P.Sukhatme,J.K.Nayak	Tata McGraw Hill
2	Wind and Solar Power System		M. R. Patel	CRC Press, New York
3	Renewable Energy Sources Basic Principles and Applications		G. N. Tiwari and M. K.Ghoshal	Narosa Publishing House,New Delhi

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/B.H.Khan%20Book%20RES.pdf
2	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	https://youtu.be/mh51mAUexK4
2	https://youtu.be/MLkNHibqUa4
	https://youtu.be/3iBf1alBhr8

V SEMESTER
22EL553: OE I: Solar Power Plant Design and Installation

Course Outcomes:
Upon successful completion of the course the students will be able to The students will be able to: CO1: Assess customer's PV system requirement. CO2: Plan and arrange for installation. CO3 Coordinate with colleagues at workplace CO4:Ensure safety at workplace

Unit:1	Solar Power Plant	7 Hours
How solar is beneficial to Industry and Residences, Types of Solar Power Plant, Grid Connected solar Power Plant, Net Metering Solar Power Plant, Behind the meter, 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, selection of site and shadow analysis, Selection of PV module technology		

Unit:2	Selection of PV module technology and Sizing	6 Hours
Types Crystalline module cells, Manufacturing process of PV cells, Comparison between mono crystalline, Selection of PV cells, Selection of front and rear sheet Selection of PV module glass, Selection of EVA sheet , Bus bar and frame		

Unit:3	Inverters Selection and Sizing	7 Hours
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		

Unit:4	Selection and sizing of AC and DC Cable, Earthing and Lightning Arrestor	6 Hours
Sizing of solar cable /DC cable, Sizing of String cable, Derating factor of cables Sizing of AC cable (Inverter to ACDB ,ACDB to MDB), Sizing of DC cable (Module to SMB , SMB to Inverter), Solar Plant resistance calculation Preparation AC /DC earthing layout, Selection of lightening protection device Selection of ESE type Lightening Protection.		

Unit:5	Plant Installation and Government policies	7 Hours
IEC Standards, Equipment Installation, Monitoring Equipment, Commissioning System Installation & Pre-Commissioning Checklist, Commissioning Test Sheets. Introduction to State & Central policies, Net meter policy of Maharashtra state, Various scheme of Solar net metering. Case Study KUSUM & Ultra Mega solar power projects. Introduction to Solar PV Design and Simulation software like HOMER Pro, PV F-Chart, pvPlanner, PVsyst, RETscreen, System Advisor Model (SAM), Solar Pro		

Unit :6	Maintenance And Troubleshooting	6 Hours
Preparation of checklist for maintenance as per OEM recommendation for: Module, Inverter, DC cabling & SMB, AC Cabling ACDB, MDB, Checking functionality and protection system, Measurement of earthing resistance, Efficiency measurement of plant. Monitoring Equipment, Commissioning System Installation & Pre-Commissioning Checklist, Commissioning Test Sheets, Staff Management		
	Total Lecture Hours	**39 Hours**

Text books	
1	Solar Photovoltaic Technology and Systems 1st edition 2013 Chetan Singh Solanki PHI Learning Delhi
2	Implementation of Solar Thermal and Photovoltaic Systems,Covrig Claudiu,LAP Lambert Academic
3	Publishing Photovoltaics for Professionals - Solar Electric Systems-Marketing, Design and Installation,Falk Antony Taylor & Francis Ltd
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
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/Solar%20Energy%20pdf.pdf
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/sh4ZjiVlRC4?feature=shared
2	https://youtu.be/ANZMrVGUlvA?feature=shared

V SEMESTER
22EL571: OE II: Electrical Energy Audit and Safety

Course Outcomes:

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

1. Classify, the consumption pattern, conservation of electrical energy and Electricity Act 2001.
2. Demonstrate different forms of energy to optimize the use for maximizing the efficiency of system.
3. Examine the proper utilization of energy by energy management and audit.
4. Analyze the various Global Environmental Concerns 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**	**6 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**	**6 Hours**
Defining monitoring & targeting, elements of monitoring & targeting, data and information- analysis, techniques - energy consumption, production, cumulative sum of differences (CUSUM).		
Unit:5	**Global environmental concerns**	**7 Hours**
United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), Prototype Carbon fund (PCF).		
Unit :6	**Electrical Safety**	**6 Hours**
Primary hazards associated with electricity. Control measures and safety-related work practices to minimize the risk associated with electrical hazards. Response procedures in the event of electrical shock or fire.		
	Total Lecture Hours	**39 Hours**

Text Books:			
S. N.	**Author**	**Title**	**Publisher**
01	Archie,W Culp	Principles of Energy Conversion	McGraw Hill
02	Wayne C Turner	Energy Management Handbook Bureau	John Willey and Sons
03		Bureau of Energy Efficiency Study Material forEnergy Managersand Auditors Examination	Bureau of Energy Efficiency www.beeindia.in

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1	
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/9jQzncO30iM?feature=shared
2	https://youtu.be/s7ublNm6ZV4?feature=shared
3	https://youtu.be/G2m8QJWPNXA?feature=shared
4	https://youtu.be/bImSwvSvbS0?feature=shared

V SEMESTER
22EL573: OE II: Power System Engineering

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Interpret & Outline types of load and power system concepts required to engineering problems. 2. Develop the ability to implement the appropriate safety equipments for design of electrical power system which relate the enhancing the efficiency of the transmission and distribution system with environment friendly technology. 3. Formulate & Solve A.C and D.C distribution networks for necessary variable calculation. 4. Ability to design and analyze switchgear protection system with respect to various electrical parameters which show the required substation parameters.

Unit:1	Introduction to Power System	7 Hours
Restructuring of power sector, Constituents of present day power system, sources of electrical energy, types and characteristics of generating stations: Thermal, hydro, nuclear , solar ,wind and other renewable, salient features of electricity act 2003.		

Unit:2	Load on Power Stations	6 Hours
Load, Important terms and factors, and Units generated per annum , Load duration curve , Types of loads, Load demand and diversity factors, Load curves and selection of generating units, Base load and peak load on Power station, Method of meeting the load ,Interconnected grid system.		

Unit:3	Transmission System I	7 Hours
Electric supply system, A.C power supply scheme, D.C transmission scheme, Comparison of AC and DC transmission system, advantages of A.C. transmission system, Comparison of various transmission system (Two wire dc system, Single phase two wire A.C system, Single phase three wire system , three phase three wire system, Three phase four wire system) Elements of transmission line, Economic choice of transmission voltage, requirements of satisfactory electric supply, Concept of HVDC transmission.		

Unit:4	Transmission System II	6 Hours
Line support insulators, types of insulators (pin type, suspension type, strain type, shackle type), Commonly used conductor material, concept of corona, factor affecting corona, advantages and disadvantages of corona, methods of reducing corona effect, Sag and its effects, Constants of transmission line (R, L and C) , Resistance of transmission line, skin effect , Classification of overhead transmission line and voltage regulation		

Unit:5	Distribution System	7 Hours
Classification of distribution system, Types of distribution AC and DC, Overhead verses underground system, Requirements of distribution system, Design consideration of distribution system, AC distribution types, Voltage drop calculations in different distribution system , importance of voltage control, location of voltage control equipment and its methods, Tap changing transformer , Concept of tariff, desirable characteristics of tariff, types of tariff.		
Unit :6	**Introduction to Switchgear**	**6 Hours**
Essential features of switchgear, switchgear equipment's, switches, fuses, circuit breakers, relays, HRC fuses, Bus Bar arrangement (single bus system, One and half feeder ,Main and transfer bus system) , MCB, MCCB, ELCB Introduction to Instrument transformer Current Transformer (CT) and Potential transformer (PT).		
	Total Lecture Hours	**39 Hours**

Text books:				
	Title	**Edition**	**Author**	**Publication**
1.	Power System Analysis	1st edition 2007	T.K. Nagsarkar, M.S. Sukhija	Oxford
2.	Principles of Power System	2nd edition 2005	V.K.Mehta,Rohit Mehta	S.Chand
3.	Electrical Power System	5th edition 2007	Ashfaque Hussain	CBS
References				
1	Electrical Power System	5th edition 2007	Ashfaque Hussain	CBS

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/Principles%20of%20Power%20Systems%20V.K%20Mehta%20(1).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
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/AAJyUk4wHfI?feature=shared
2	https://youtu.be/uy9lZCdkQIM?feature=shared
3	https://youtu.be/UW4HYJ36q0Y?feature=shared

V SEMESTER
22EL506 : Industrial Training, Seminar and Report

V SEMESTER
Audit Course
MLC2125 : YCAP5: YCCE Communication Aptitude Preparation

V SEMESTER
Audit Course
MLC125: YCAP5: Design thinking

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

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)

SoE No. 22EL-101

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Electrical Engineering)

B. Tech in Electrical Engineering

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	22EL601	Power System Analysis	T	3	0	0	3	3	30	20	50	3 Hrs
2	6	PC	EL	22EL602	Electric Vehicles	T	3	0	0	3	3	30	20	50	3 Hrs
3	6	PC	EL	22EL603	**Lab:**Electric Vehicles	P	0	0	2	2	1		60	40	
4	6	PE	EL		**Professional Elective -III**	T	3	0	0	3	3	30	20	50	3 Hrs
5	6	PE	EL		**Lab. Professional Elective -III**	P	0	0	2	2	1		60	40	
6	6	PE	EL		**Professional Elective -IV**	T	3	0	0	3	3	30	20	50	3 Hrs
7	6	PC	EL	22EL604	Lab:Simulation of Power Electronics & Power System	P	0	0	2	2	1		60	40	
8	6	PC	EL	22EL605	**Lab.:**Substation Design	P	0	0	2	2	1		60	40	
9	6	PC	EL	22EL606	Project Phase I	P	0	0	4	4	2		60	40	
10	6	OE	EL		**Open Elective - III**	T	3	0	0	3	3	30	20	50	3 Hrs
11	6	OE	EL		**Open Elective - IV**	T	3	0	0	3	3	30	20	50	3 Hrs
					TOTAL SIXTH SEM		**18**	**0**	**12**	**30**	**24**				

List of Professional Electives- III & IV

Professional Electives-III

1	6	PE-III	EL	22EL611	PEIII:Electrical Installation Design
		PE-III		22EL612	PEIII:Lab:Electrical Installation Design
2	6	PE-III	EL	22EL613	PEIII:Electrical Energy Audit and Safety Analysis
		PE-III		22EL614	PEIII:Lab:Electrical Energy Audit and Safety Analysis
3	6	PE-III	EL	22EL615	PEIII:Computer Methods in Power System
		PE-III		22EL616	PEIII:Lab:Computer Methods in Power System
4	6	PE-III	EL	22EL617	PEIII:Project Planning and Management
		PE-III		22EL618	PEIII:Lab: Project Planning and Management

Professional Electives -IV

1	6	PE-IV	PE	22EL631	PEIV: Advanced Power Electronics
2	6	PE-IV	PE	22EL632	PEIV: Advanced Electrical Drives
3	6	PE-IV	PE	22EL633	PEIV: Grid integration in Renewable Energy Systems
4	6	PE-IV	PE	22EL634	PEIV: Power System Operation and Management
5	6	PE-IV	PE	22EL635	PEIV : Microgrid

Open Elective-III

1	6	OE-III	EL	22EL651	OEIII:Renewable Energy Generation System
2	6	OE-III	EL	22EL652	OEIII:Electrical Machines and their Applications
3	6	OE-III	EL	22EL653	OEIII:Solar Power Plant Design and Installation

Open Elective-IV

1	6	OE-IV	EL	22EL671	OEIV:Electrical Energy Audit and Safety
2	6	OE-IV	EL	22EL672	OEIV:Utilization of Electrical Energy
3	6	OE-IV	EL	22EL673	OEIV:Power System Engineering

Audit Courses

1	6	HS		MLC2126	YCCE Communication Aptitude Preparation (YCAP6)	**A**	3	0	0	3	0

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

TA ** = for Theory : 12 marks on lecture quizzes, 12 marks on two TA2 activities decided by course teacher, 2 marks on class attendance and 4 marks on TA4 activities

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

		June 2022	**1.00**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

VI SEMESTER
22EL601 : 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**	**6 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**	**6 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	6 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	**39 Hours**

Text books	
1	Electrical Power System ,5th edition 2007 ,Ashfaque Hussain,CBS
Reference Books	
1	Elements of Power System Analysis,4th-1984,W. D. Stevenson,Tata McGraw Hill
2	Modern Power System analysis , 4th-2011 ,I. J. Nagrath & D. P. Kothari ,Tata McGraw Hill
3	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
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
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

VI SEMESTER
22EL602 : Electric Vehicles

Course Outcomes:

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

1.Apply the concept of dynamics to size the electric powertrain
2. Identify the different energy and power sources and utilize their characteristcs for Electric Vehicles
3. Analyze the speed torque characteristics of traction motors and their operation
4. Illustrate the HEV architecture, powertrain, sizing and their operation

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. (6 Hours)		
Unit:2	**Battery**	**6 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**	**6 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**	**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	**Drive Train**	**6 Hours**
EV transmission configuration, transmission components, gears, automobile differential, clutch, brakes, ideal gear box, EV motor sizing (Numerical).		
	Total Lecture Hours	**39 Hours**

Text books	
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
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/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

VI SEMESTER
22EL603: Lab: Electric Vehicles

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

Sr. No.	Experiments based on
1	To determine Battery controller based on State of Charge (SoC)for charging and discharging of battery using MATLAB/SIMULINK
2	To Model and simulate Battery Management System for Active cell balancing using MATLAB/ SIMULINK
3	To model SoC control of lithium ion battery using MATLAB/ SIMULINK in EV.
4	To simulate bidirectional operation in EV charger using single-phase model.
5	To evaluate the speed of an EV using a motor toque using MATLAB/SIMULINK.
6	To model Speed control of EV using BLDC motor using MATLAB/ SIMULINK.
7	To model Speed control of EV using PMSM motor using MATLAB/ SIMULINK.
8	To simulate Electric Vehicles using MATLAB/ SIMULINK.
9	To simulate SPWM Technique for Electric Vehicle using MATLAB/SIMULINK
10	To simulate three phase VSI for grid integration in EV using MATLAB/SIMULINK

VI SEMESTER
22EL604: Lab: Simulation of Power Electronics and Power System

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Simulate the various power processing circuits such as converters,dc/dc regulators and inverters
2. Develop simulation circuit to quantify the performance of short, medium and long transmission lines.
3. Analyze the performance of processing circuits and transmission line

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

Sr. No.	Experiments based on
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

VI SEMESTER
22EL605: Lab: Substation Design

Course Outcomes:
Upon successful completion of the course the students will be able to 1.

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

Sr. No.	Experiments based on
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VI SEMESTER
22EL606: Project Phase I

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Identify the research area of project work in Electrical Engineering 2. Summarize the literature review in the area identified, propose the objectives of project work. 3. Organize requisite components with specifications for the project software/hardware prototype and apply suitable software/hardware tool in project work 4. Compile project work to prepare a thesis report and present a research paper on project

VI SEMESTER
22EL611: PE III: Electrical Installation and Design

Course Outcomes:
Upon successful completion of the course the students will be able to 1.Classify the techniques used to identify the load pattern 2. Explain various types of wires, cables used in distribution systems and their tests 3. Identify different types of luminaries and develop calculation skills. 4. Analyze various components involved in substation and their function. 1.

Unit:1		**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		**6 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		**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		**6 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, lightening 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)		
Unit:5		**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		**6 Hours**
Site testing of transformers (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	**39 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/Suported%20file/Supprted%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

VI SEMESTER
22EL612: Lab: Electrical Installation and Design

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

Sr. No.	Experiments based on
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VI SEMESTER
22EL613: PE III: Electrical Energy Audit and Safety Analysis

Course Outcomes:
Upon successful completion of the course the students will be able to 1.Describe, the energy sources, methods of energy conservation and its pattern, electricity act 2003 2. Interpret different forms of electrical and thermal energy. 3. Estimate the Energy Management, Energy Audit, Energy Monitoring and Targeting. 4. Determine the various Global Environmental Concerns and Electrical safety procedures. 1.

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**	**6 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**	**6 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 rewound motors, variable speed drive: principles and applications, factors for successful implementation of variable speed drive		
Unit :6	**Captive and Cogeneration Systems**	**6 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	**39 Hours**

Text Books				
S.N	**TITLE**	**EDITION**	**AUTHOR**	**PUBLICATION**
1	Principles of Energy Conversion		Archie,W Culp	McGraw Hill
2	Energy Management Handbook		Wayne C Turner	John Willey and Sons
3	Bureau of Energy Efficiency Study Material for Energy Managers and Auditors Examination			Bureau of Energy Efficiencywww.beeindia.in

Reference books				
S.N	**TITLE**	**EDITION**	**AUTHOR**	**PUBLICATION**
1	Handbook on Energy Auditand Management		Amit Kumar Tyagi	

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/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

VI SEMESTER
22EL614: Lab: Electrical Energy Audit and Safety Analysis

Course Outcomes:
Upon successful completion of the course the students will be able to 1.

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

Sr. No.	Experiments based on
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

VI SEMESTER
22EL615: PE III: Computer Methods in Power System

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Build and construct different types of Matrices using graph theory, Apply different methods to Build & Develop the A, B, C, K, Impedance and admittance Matrices 2. Make use of different methods and Analyze Load Flow studies 3. Determine the fault current and voltages for different types of faults by using Zbus 4. Make use of different methods for Transient Stability Studies

Unit:1	**Incidence and network matrices**	**7 Hours**
Incidence and network matrices: - Graph incidence Matrices, Primitive network, formation of network matrices by singular transformations		
Unit:2	**Algorithm for single phase network**	**6 Hours**
Algorithm for formation of Bus Impedance and Bus Admittance matrix for system without mutual coupling		
Unit:3	**Three Phase Networks**	**7 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**	**6 Hours**
Short circuit studies: Three phase network short circuit calculations using bus impendence matrix for balanced and unbalanced faults. Computer programme for short circuit studies on simple system		
Unit:5	**Transient stability studies**	**7 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**	**6 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	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Text books:				
SN	**TITLE**	**EDITION**	**AUTHOR**	**PUBLISHER**
1	Computer Methods in PowerSystems	1st 1968	Stag and El – Abiad	Mc Graw Hill
2	Elements of Power SystemAnalysis	1982	William D.Stevenson	Mc Graw Hill

Reference books:				
SN	**TITLE**	**EDITION**	**AUTHOR**	**PUBLISHER**
1	Computer Analysis in PowerSystem Modern Power System Analysis	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/Suported%20file/Supprted%20file/e-copies%20of%20books/Electrical%20Engineering/CMPS/Computer%20Methods%20In%20Power%20Systems%20Analysis%20(%20PDFDrive.com%20).pdf
MOOCs Links and additional reading, learning, video material	
1	https://www.youtube.com/watch?v=l9mdIbr3dV8&pp=ygUqTlBURUwgVklERU8gT04gdHJhbnNpZW50IHN0YWJpbGl0eSBzdHVkaWVz
2	https://www.youtube.com/watch?v=UeaTgT2p-WI&list=PLRWKj4sFG7-6gWwDMLI0Wy5DDRqyKP1uQ
3	https://www.youtube.com/watch?v=rEyE3NxK8vE&pp=ygUgbnB0ZWwgdmlkZW8gb24gbG9hZCBmbG93IHN0dWRpZXM%3D

VI SEMESTER
22EL616: Lab: Computer Methods in Power System

Course Outcomes:

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

1. Build and construct different types of Matrices using graph theory, Apply different methods to Build & Develop the A, B, C, K, Impedance and admittance Matrices
2. Make use of different methods and Analyze Load Flow studies
3. Determine the fault current and voltages for different types of faults by using Z_{bus}
4. Make use of different methods for Transient Stability Studies

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 Y_{bus} by Singular Transformation
4	Write a program to find Z_{bus} by building algorithm method
5	Write a program to obtain Y_{bus} 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

VI SEMESTER
22EL617: PE III: Project Planning and Management

Course Outcomes:

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

1. Define the methodologies involved in project planning, the role of project manager and various project planning tools involved.
2. Analyze the cost, and the risk involved
3. Synthesis the material handling and earth moving equipment's
4. Remember 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**	**6 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**	**6 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**	**6 Hours**
Types of Contract, Tendering (Techno-commercial aspects), Motivation Theories, Communication and reporting, Importance of coordination, Logistick management, Inspection, Testing, Transportation, Commissioning, Trial run, Documentation required for project handover, Preparing a project report for failure reference.		
	Total Lecture Hours	**39 Hours**

Textbooks:				
	Title	**Edition**	**Author**	**Publisher**
1	Project Management: A Systemic Approach to Planning, Scheduling and Controlling	2002	Horald Kerzner	CBS Publishers
2	Project Planning and Control with PERT and CPM		B. C. Punmia, K.K. Khandelwal	Laxmi Publication.
3	Construction equipment and management		Sharma S.C.	Khanna Publishers,New Delhi.
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Construction Project Scheduling		Callahan M. T., Quackenbush D. G. and rowing J. E.	McGraw Hill ,New York
2	Construction Planning and Equipment Methods		Peurifoy R. L., Ledbetter W. B and schexnayder C.	McGraw Hill, Singapore.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/W2EdffbwgcM?feature=shared
2	https://youtu.be/W2EdffbwgcM?feature=shared

VI SEMESTER
22EL618: Lab: Project Planning and Management

Course Outcomes:
Upon successful completion of the course the students will be able to 1.

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

Sr. No.	Experiments based on
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VI SEMESTER
22EL631: Advanced Power Electronics

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Identify and recall various power semiconductor devices and their effects produced in electrical system 2. Explain and compare various power electronic converters and inverters used for various applications 3. Apply knowledge of modulation techniques to various converters 4. Demonstrate knowledge related to effects of harmonics, their measurement and elimination from the system

Unit:1	**Power Semiconductor Devices**	**7 Hours**
Power Semiconductor Devices: Metal Oxide Turn off thyristor (MTO), Metal oxide Controlled Thyristor (MCT),Emitter Turn off Thyristor (ETO),integrated gate commutated thyristor(IGCT).		
Unit:2	**Resonant Converters**	**6 Hours**
Introduction to resonant converters, Classifications of Quasi resonant switches, Zero Current switching (ZCS) quasi buck converter. Zero voltage switching (ZCS) quasi buck converter. Zero Current switching (ZCS) quasi boost converter.		
Unit:3	**Multilevel Inverters**	**7 Hours**
Multilevel Inverters:DiodeClampedInverters,FlyingCapacitorInverters,CascadedmultilevelInvertersandHybridCascadedInverter.Introductiontolatestmultilevelinverter topologies.		
Unit:4	**Modulation Techniques**	**6 Hours**
Modulation Techniques: Pulse Width Modulation, Selective Harmonic Elimination (SHE) Space Vector Pulse Width Modulation (SVPWM)		
Unit:5	**Harmonics: Causes and Effects**	**7 Hours**
Harmonics: Effects within power system, Interference with Communication Harmonic Measurements and Harmonic Indices		
Unit :6	**Harmonics Mitigation Techniques**	**6 Hours**
Passive Filter,, and Shunt Active Power Filter and Series Active Power Filter		
	Total Lecture Hours	**39 Hours**

Text Books				
S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Power Electronics:Converters, Application andDesign	2007	Ned Mohan, T.M. Undeland and W.P. Robbins	Wiley Publication(Wiley Student Edition)
2	Power Electronics; Principles and Applications	2017	Joseph Vithayathil	Tata McGraw Hill Publication (Indian Edition)
3	Power Electronics and AC Drives	2003	B.K. Bose	Pearson Education
Reference Books				
1	Power Semiconductor Circuits	1984	S.B. Dewan and Straughen	John Wiley and Sons, Inc

VI SEMESTER
22EL632 : Advanced Electrical Drives

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Calculate the converter parameters of bridge and chopper-controlled DC drives. 2. Analyse the various schemes for Induction motor control and estimate the parameters of converters for Induction motor drives. 3. Explain synchronous motor, stepper motor and switched reluctance motor drives. 4. compare the various drives used in electrical traction . 1.

Unit:1	**Introduction to Electric Drives**	**7 Hours**
Dynamics of electric drives and control of electric drives, Fundamental Torque equation, Control Schemes, Power modulator, Four Quadrant operation, Energy conservation in electric drives.		
Unit:2	**D.C. Drives**	**6 Hours**
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; Power factor, supply harmonics and ripples in motor current; Chopper controlled of separately excited dc motor; chopper control of series motor; source current harmonics.		
Unit:3	**Induction Motor Drives**	**7 Hours**
Stator voltage control, V/f control, static rotor resistance control, slip power recovery schemes, variable frequency control using voltage source inverter. Current sources inverter and cyclo converter, Introduction to vector control of Induction motor		
Unit:4	**Synchronous Motor Drives**	**6 Hours**
Starting and Braking of Synchronous motor; variable frequency control; self-controlled synchronous motor drive employing load commutated thyristor inverter , Introduction of Cyclo-converter control of Synchronous motor; starting of large synchronous motors.		
Unit:5	**Special Motors Drives**	**7 Hours**
Brush less dc motor, stepper motor switched reluctance motor drives and eddy current drives. Introduction to solar and battery powered drives.		
Unit :6	**Traction Drives**	**6 Hours**
DC and AC traction drives, semiconductor converter controlled Drives; 25 KV AC traction using semi conductor converter controlled DC motor; DC traction using semiconductor chopper controlled dc motors; polyphase AC motors for traction drives.		
	Total Lecture Hours	**39 Hours**

Text books				
S.N	**Title**	**Year/Edition**	**Author**	**Publisher**
1	Fudamentals of Electric drives	2nd Edition	G. K.Dubey	Narosa Publications
2	Modern Electric Traction	2003	H.Pratap	Dhanpat Rai & Company
3	Electric drives concepts and applications	2005	V.Subramaniam	Tata McGraw Hill
4	Electric Motor Drives	2001	R. Krishnan	Prentice Hall India

Reference books				
S.N	**Title**	**Year/Edition**	**Author**	**Publisher**
1	Electrical Machines Drives and Power Systems	6th edition 2008	Theodore Wildi	Pearson Education

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-642-25904-3
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/JZ6f_i4ao6Y
2	https://youtu.be/1AT1yuQ9awM
3	https://youtu.be/zWvcM-4aUgg

VI SEMESTER
22EL633 : Grid Integration in Renewable Energy Systems

Course Outcomes:

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

1. Analyse the need of integrating large renewable energy sources in the existing power system.
2. Assess renewable energy applications in the context of grid integration.
3. Enhance the understanding of renewable energy policy environment.
4. Explain the impacts of renewable energy integration on grid and environment.

Unit:1	**Introduction**	**6 Hours**
Concept of nano/micro/mini grid. Need of integrating large renewable energy sources, Concept of Virtual Power Plant (VPP).		
Unit:2	**Grid Integrated Solar PV System**	**7 Hours**
Basics of solar photovoltaics: cell, modules and arrays. Structure and components required for grid connected PVsystem, it's working. Introduction to energy storage for PV application.		
Unit:3	**Grid Integrated Wind Energy Conversion System**	**6 Hours**
Structure and components required for grid connected Wind Energy Conversion System, types of wind turbines, it's working.		
Unit:4	**Policies and various schemes for Renewable Energy in India**	**7 Hours**
Introduction to Indian Energy Policy, Grid Code, Green Corridor, policy and regulatory framework for rural electrification: Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM), various other schemes (eg. JNNSM etc.)		
Unit:5	**Impact of Renewable Energy Generation on Environment**	**7 Hours**
Environmental impacts of wind power, solar power, biomass, hydroelectric power, geothermal power, Carbon credits, National action plan on climate change: 1. National Solar Mission 2. National Mission for Enhanced Energy Efficiency 3. National Water Mission 4. National Mission for a Green India 5. National Mission for Sustainable Agriculture		
Unit :6	**Impact of Renewable Energy Generation on Grid**	**7 Hours**
Importance of power quality and corresponding standards, THD, voltage regulation. Voltage rise, voltage unbalance, frequency change and its effects, system protection.		
	Total Lecture Hours	**39 Hours**

Text book	
1	Grid integration of solar photovoltaic systems, Majid Jamil, M. Rizwan, D.P.Kothari, CRC Press (Taylor &Francis group), 2017.
Reference Books	
1	Renewable Energy Grid Integration, Marco H. Balderas, Nova Science Publishers, New York, 2009.
2	Wind Power Integration connection and system operational aspects, B. Fox, D. Flynn L. Bryans, N. Jenkins, M.O' Malley, R. Watson and D. Milborrow, IET Power and Energy Series 50 (IETdigital library), 2007.
3	Integration of Alternative sources of Energy, Felix A. Farret and M. Godoy Simoes, IEEE Press – Wiley-Interscience publication, 2006.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Vijay Vittal, Raja Ayyanar, Grid Integration and Dynamic Impact of Wind Energyhttp://link.springer.com/openurl?genre=book&isbn=978-1-4419-9322-9
2	Francis McGowan, European Energy Policies in a Changing Environment http://link.springer.com/openurl?genre=book&isbn=978-3-7908-0951-0
MOOCs Links and additional reading, learning, video material	
1	P R Krithika and Siddha Mahajan, Background paper: Governance of renewable energy in India: Issues and challenges http://www.gpgl.in/assets/governance-of-renewable-energy-in-india-issues-challenges.pdf
2	ÇSE Presentation: Renewable Energy in India: Growth and Targets http://cseindia.org/docs/photogallery/ifs/Renewable%20Energy%20in%20India%20Growth%20and%20Targets.pdf
3	Charles K Ebinger, India's Energy and Climate Policy Can India Meet the Challenge of Industrialization and ClimateChange? https://www.brookings.edu/wp-content/uploads/2016/07/india_energy_climate_policy_ebinger.pdf
4	Guidelines Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY), Scheme of Government of India for rural electrification.https://www.ddugjy.gov.in/assets/uploads/1548234273fykio.pdf
5	Gisele Schmid, The development of renewable energy power in India: which policies have been effective? https://unige.ch/gsem/iee/files/3313/9574/8551/11103_v2.pdf
6	Impact of wind power on the power system imbalances in Finland, A. Helander1, H. Holttinen, J. Paatero, IET Renew.Power Generation., Vol. 4, No. 1, pp. 75–84, 2010.
7	Impact of widespread photovoltaic generation on distribution systems, M. Thomson and D.G. Infield, IET Renew. PowerGeneration, Vol. 1, No.1, pp. 33–40, 2007.
8	A. Rahman, S. Agrawal, A. Jain, "Powering Agriculture in India: Strategies to Boost Components A & C under PM-KUSUM Scheme", Council on Energy, Environment and Water (CEEW), New Delhi, India, 2021.

VI SEMESTER
22EL634 : Power System Operation and Management

Course Outcomes:
Upon successful completion of the course the students will be able to
1. To calculate various factors & reserve requirement for economic aspects of power system.
2. Evaluate optimal unit committment ,load forecasting problem & optimal scheduling of generating unit
3. Explain the concept of Single area load frequency control.
4. Write various methods of voltage control,reactive power compensation

Unit:1	**Economic Aspects**	**7 Hours**
Introduction, system load characteristics curves-chronological load curves-load duration curves-energy time curves load factor utilization factor-diversity factor- coincidence factor- demand factor- reserve requirements installed reserve- spinning reserve- cold reserve- hot reserve – operational restrictions, load dispatching.		
Unit:2	**Pre requisite of Load Dispatching**	**6 Hours**
Load forecasting- components of system load- classification of base load- forecasting of the base load by method of least square fit introduction to unit commitment, unit commitment using priority ordering.		
Unit:3	**Load Frequency Control (LFC)**	**7 Hours**
Introduction, necessity of maintaining frequency constant, Load frequency Control, Governor Characteristics of single Generator, Adjustment of Governor Characteristic of Parallel Operating Unit, LFC (P-f control) Q-V Control, Generator Controller (P-f control & Q-V controllers), P-f control versus Q-V control, Dynamic Interaction between P- F and Q-V Loops, Speed-Governing System, Control Area Concept, Incremental Power Balance of Control Area, Requirements of the Control Strategy, Integral control, Concept of two area.		
Unit:4	**Economic Dispatch Control**	**6 Hours**
Incremental cost curve- co-ordination equations with loss included (No derivation of Bmn coefficient) solution of co- ordination equations using Bmn co-efficient by iteration method Base point & participation factors- Economic dispatch controller added to LFC.		
Unit:5	**Reactive Power Control**	**7 Hours**
Introduction, objective of load compensation, theory of load compensation, uncompensated transmission line, compensated transmission line, shunt compensator, series compensator, basic relationship for power flow control, Sub synchronous resonance, comparison of different types of compensating equipment for transmission systems,		
Unit :6	**Voltage Control**	**6 Hours**
Introduction, necessity of voltage control, generation and absorption of reactive power, location of voltage control equipment, methods of voltage control, rating of synchronous phase modifier.		
	Total Lecture Hours	**39 Hours**

Text Books				
S.N	**TITLE**	**EDITION**	**AUTHOR**	**PUBLICATION**
1	Power System Operation and control	1st edition	S. Sivanagarju and G. Srinivasan	Pearson Publisher
2	Power System Stability and control	1st edition	P. Kundur	TMH Publisher
3	Electrical Power system	6th edition	C. L. Wadhwa	New Age International Pvt Ltd Publisher
4	Economic Operation of power system studies	3rd edition 2010	L.K. Kirchmayer	Wiley Eastern India, New Delhi
Reference books				
S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Power Generation, Operation and control	2nd Edition	J. Wood and F. Woolenberg	John Wiley & Sons
2	Power System: Operation & Control	1st edition, 2013	Dr. K. Uma Rao	Wiley
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/powersystem%20operation%20&%20control/Power%20System%20Operation%20and%20Control%20By%20S.%20Sivanagaraju%20and%20Sreenivasan.pdf			
MOOCs Links and additional reading, learning, video material				
1	https://youtu.be/zkN13OmgGOs?feature=shared			
2	https://youtu.be/D7nUa7zRPa4?feature=shared			

VI SEMESTER
22EL651 : OEIII: Renewable Energy Generation System

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Discuss types of renewable energy sources, outline as per Global and Indian context
2. Explain various applications of Solar energy sources and classify types of wind turbine generator
3. Classify geothermal and biomass energy
4. Compare energy from ocean, tide, wave and hydro for power generation, storage methods for renewable energy sources

Unit:1	**Introduction**	**7 Hours**
Fundamentals of Renewable / Non-renewable Energy Sources, Renewable Energy sources, Renewable Energy Potential in India, Renewable Energy Sources and their sustainable development. Storage methods for renewable energy sources.		
Unit:2	**Solar Energy**	**6 Hours**
Principles, scope and applications, solar radiation, its measurement & prediction, flat plate collectors-design & theory, solar water heating, solar dryers, solar stills, solar cooling and refrigeration. Solar cells, thermal storage, street lighting, solar power generation.		
Unit:3	**Wind Energy**	**7 Hours**
Introduction, Historical development, Wind energy resources, sites identification, blade element theory, aero-foil design, component of wind energy conversion system, wind turbine generator classification, and windmill and wind electrical generator, Advantages, disadvantages, economics and present status of wind energy generation systems, grid connection of wind energy		
Unit:4	**Geothermal Energy and Biomass Energy**	**6 Hours**
Introduction, history of geothermal resources, basics of geological process, dry rock and hot aquifer analysis, geothermal exploration, geothermal well drilling and fluid extraction, utilization of geothermal resources, geothermal heat pump, site of geothermal energy in India. Biomass energy resources and conversion processes, urban waste to energy conversion.		
Unit:5	**Mini & Micro hydro-plants**	**7 Hours**
Introduction, Classification of water turbines, hydroelectric system, essential components of hydroelectric system, system efficiency, advantages and disadvantages of hydroelectric system, present Indian power scenario of mini-micro hydro.		
Unit :6	**Ocean Energy**	**6 Hours**
Ocean thermal energy conversion (OTEC), Open cycle and closed cycle OTEC, Ocean wave energy conversion, tidal energy conversion. Introduction of Fuel cells		
	Total Lecture Hours	**39 Hours**

Text Books				
S.N	**TITLE**	**EDITION**	**AUTHOR**	**PUBLICATION**
1	Non Conventional Sources of Energy	**4th edition**	G.D.Rai	Khanna Publisher
2	Energy Technology:Nonconventional Renewable and Conventional		S. Rao and B.B Parulekar	Khanna Publisher New Delhi

Reference books				
S.N	**TITLE**	**EDITION**	**AUTHOR**	**PUBLICATION**
1	Solar Energy : Principles of Thermal collection and storage	3rd edition,1994	S.P.Sukhatme,J.K.Nayak	Tata McGraw Hill
2	Wind and Solar Power System		M. R. Patel	CRC Press, New York
3	Renewable Energy Sources Basic Principles and Applications		G. N. Tiwari and M. K. Ghoshal	Narosa Publishing House,New Delhi

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/B.H.Khan%20Book%20RES.pdf
2	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	https://youtu.be/mh51mAUexK4
2	https://youtu.be/MLkNHibqUa4
3	https://youtu.be/3iBf1alBhr8

VI SEMESTER
22EL652 : OEIII: Solar Power Plant Design And Installation

Course Outcomes:
Upon successful completion of the course the students will be able to
The students will be able to: CO1: Assess customer's PV system requirement. CO2: Plan and arrange for installation. CO3 Coordinate with colleagues at workplace CO4:Ensure safety at workplace

Unit:1	**Solar Power Plant**	**7 Hours**
How solar is beneficial to Industry and Residences, Types of Solar Power Plant, Grid Connected solar Power Plant, Net Metering Solar Power Plant, Behind the meter, 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, selection of site and shadow analysis, Selection of PV module technology		
Unit:2	**Selection of PV module technology and Sizing**	**6 Hours**
Types Crystalline module cells, Manufacturing process of PV cells, Comparison between mono crystalline, Selection of PV cells, Selection of front and rear sheet Selection of PV module glass, Selection of EVA sheet , Bus bar and frame		
Unit:3	**Inverters Selection and Sizing**	**7 Hours**
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		
Unit:4	**Selection and sizing of AC and DC Cable, Earthing and Lightning Arrestor**	**6 Hours**
Sizing of solar cable /DC cable, Sizing of String cable, Derating factor of cables Sizing of AC cable (Inverter to ACDB ,ACDB to MDB), Sizing of DC cable (Module to SMB , SMB to Inverter), Solar Plant resistance calculation Preparation AC /DC earthing layout, Selection of lightening protection device Selection of ESE type Lightening Protection.		
Unit:5	**Plant Installation and Government policies**	**7 Hours**
IEC Standards, Equipment Installation, Monitoring Equipment, Commissioning System Installation & Pre-Commissioning Checklist, Commissioning Test Sheets. Introduction to State & Central policies, Net meter policy of Maharashtra state, Various scheme of Solar net metering. Case Study KUSUM & Ultra Mega solar power projects. Introduction to Solar PV Design and Simulation software like HOMER Pro, PV F-Chart, pvPlanner, PVsyst, RETscreen, System Advisor Model (SAM), Solar Pro		

Unit :6	Maintenance And Troubleshooting	6 Hours
Preparation of checklist for maintenance as per OEM recommendation for: Module, Inverter, DC cabling & SMB, AC Cabling ACDB, MDB, Checking functionality and protection system, Measurement of earthing resistance, Efficiency measurement of plant. Monitoring Equipment, Commissioning System Installation & Pre-Commissioning Checklist, Commissioning Test Sheets, Staff Management		
	Total Lecture Hours	**39 Hours**

Text books	
1	Solar Photovoltaic Technology and Systems 1st edition 2013 Chetan Singh Solanki PHI Learning Delhi
2	Implementation of Solar Thermal and Photovoltaic Systems,Covrig Claudiu,LAP Lambert Academic Publishing
3	Photovoltaics for Professionals - Solar Electric Systems-Marketing, Design and Installation,Falk AntonyTaylor & Francis Ltd
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
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/Solar%20Energy%20pdf.pdf
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/sh4ZjiVlRC4?feature=shared
2	https://youtu.be/ANZMrVGUlvA?feature=shared

VI SEMESTER
22EL671:OEIV: Electrical Energy Audit and Safety

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Classify, the consumption pattern, conservation of electrical energy and Electricity Act 2001. 2. Demonstrate different forms of energy to optimize the use for maximizing the efficiency of system. 3.Examine the proper utilization of energy by energy management and audit. 4. Analyze the various Global Environmental Concerns 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**	**6 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**	**6 Hours**
Defining monitoring & targeting, elements of monitoring & targeting, data and information- analysis, techniques - energy consumption, production, cumulative sum of differences (CUSUM).		
Unit:5	**Global environmental concerns**	**7 Hours**
United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), Prototype Carbon fund (PCF).		
Unit :6	**Electrical Safety**	**6 Hours**
Primary hazards associated with electricity. Control measures and safety-related work practices to minimize the risk associated with electrical hazards. Response procedures inthe event of electrical shock or fire.		
	Total Lecture Hours	**39 Hours**

Text Books:			
S. N.	**Author**	**Title**	**Publisher**
01	Archie,W Culp	Principles of Energy Conversion	McGraw Hill
02	Wayne C Turner	Energy Management Handbook Bureau	John Willey and Sons
03		Bureau of Energy Efficiency Study Material forEnergy Managersand Auditors Examination	Bureau of Energy Efficiency www.beeindia.in

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1	
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/9jQzncO30iM?feature=shared
2	https://youtu.be/s7ublNm6ZV4?feature=shared
3	https://youtu.be/G2m8QJWPNXA?feature=shared
4	https://youtu.be/bImSwvSvbS0?feature=shared

VI SEMESTER
22EL673 : OEIV: Power System Engineering

Course Outcomes:

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

1. Interpret & Outline types of load and power system concepts required to engineering problems.
2. Develop the ability to implement the appropriate safety equipments for design of electrical power system which relate the enhancing the efficiency of the transmission and distribution system with environment friendly technology.
3. Formulate & Solve A.C and D.C distribution networks for necessary variable calculation.
4. Ability to design and analyze switchgear protection system with respect to various electrical parameters which show the required substation parameters.

Unit:1	Introduction to Power System	7 Hours

Restructuring of power sector, Constituents of present day power system, sources of electrical energy, types and characteristics of generating stations: Thermal, hydro, nuclear , solar ,wind and other renewable, salient features of electricity act 2003.

Unit:2	Load on Power Stations	6 Hours

Load, Important terms and factors, and Units generated per annum , Load duration curve , Types of loads, Load demand and diversity factors, Load curves and selection of generating units, Base load and peak load on Power station, Method of meeting the load ,Interconnected grid system.

Unit:3	Transmission System I	7 Hours

Electric supply system, A.C power supply scheme, D.C transmission scheme, Comparison of AC and DC transmission system, advantages of A.C. transmission system, Comparison of various transmission system (Two wire dc system, Single phase two wire A.C system, Single phase three wire system , three phase three wire system, Three phase four wire system) Elements of transmission line, Economic choice of transmission voltage, requirements of satisfactory electric supply, Concept of HVDC transmission.

Unit:4	Transmission System II	6 Hours

Line support insulators, types of insulators (pin type, suspension type, strain type, shackle type), Commonly used conductor material, concept of corona, factor affecting corona, advantages and disadvantages of corona, methods of reducing corona effect, Sag and its effects, Constants of transmission line (R, L and C) , Resistance of transmission line, skin effect , Classification of overhead transmission line and voltage regulation

Unit:5	Distribution System	7 Hours

Classification of distribution system, Types of distribution AC and DC, Overhead verses underground system, Requirements of distribution system, Design consideration of distribution system, AC distribution types, Voltage drop calculations in different distribution system , importance of voltage control, location of voltage control equipment and its methods, Tap changing transformer , Concept of tariff, desirable characteristics of tariff, types of tariff.

Unit :6	Introduction to Switchgear	6 Hours
Essential features of switchgear, switchgear equipment's, switches, fuses, circuit breakers, relays, HRC fuses, Bus Bar arrangement (single bus system, One and half feeder ,Main and transfer bus system) , MCB, MCCB, ELCB Introduction to Instrument transformer Current Transformer (CT) and Potential transformer (PT).		
	Total Lecture Hours	**39 Hours**

Text books:

SN	Title	Edition	Author	Publication
1	Power System Analysis	1st edition 2007	T.K. Nagsarkar, M.S. Sukhija	Oxford
2	Principles of Power System	2nd edition 2005	V.K.Mehta, Rohit Mehta	S.Chand

Reference Books	
1	Electrical Power System,5th edition 2007, Ashfaque Hussain, CBS
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/Principles%20of%20Power%20Systems%20V.K%20Mehta%20(1).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
MOOCs Links and additional reading, learning, video material	
1	https://youtu.be/AAJyUk4wHfI?feature=shared
2	https://youtu.be/uy9lZCdkQIM?feature=shared
3	https://youtu.be/UW4HYJ36q0Y?feature=shared

VI SEMESTER
Audit Course
MLC126 : YCCE Communication Aptitude Preparation (YCAP6)