VIVEKANANDHA

COLLEGE OF ENGINEERING FOR WOMEN

(An Autonomous Institution Affiliated to Anna University-Chennai)

Approved by AICTE – Accredited by NAAC and ISO 9001:2015 Certified

Elayampalayam, Tiruchengode – 637 205, Namakkal District, Tamilnadu.

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

M.E- POWER SYSTEMS ENGINEERING

(CURRICULUM & SYLLABI -2023)

(Applicable to the students admitted from the Academic year 2023-2024 onwards)

(Regulation 2023)

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COLLEGE VISION

To impart value based education in Engineering and Technology to empower young women to meet the societal exigency with a global outlook.

COLLEGE MISSION

- To provide holistic education through innovative teaching-learning practices
- To instill self confidence among rural students by supplementing with co-curricular and Extra-curricular activities.
- To inculcate the spirit of innovation through training, research and development
- To provide industrial exposure to meet the global challenges
- To create an environment for continual progress through lifelong learning

DEPARTMENT VISION

The Vision of Electrical and Electronics Engineering Department is to be a center of excellence in technical education and research by producing world-class graduates to meet future challenges of the country.

DEPARTMENT MISSION

The Mission of the Electrical and Electronics Engineering Department is

- To impart quality education to our students and provide a comprehensive understanding of Electrical & Electronics Engineering and produce a new generation of knowledgeable, skilled, innovative engineers.
- To stabilize the students to understand the responsibility as an engineer who prove to be good citizens having concern for society, environment and ethical issues.
- To evolve the student community to adapt appropriate sustainable technologies through remarkable contribution for rural needs.

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PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

PEO1: To provide students with the knowledge of Basic Sciences in general and Electrical and electronics Engineering in particular so as to acquire the necessary skills for analysis and synthesis of problems in generation, transmission and distribution.

PEO2: To provide technical knowledge and skills to identify, comprehend and solve complex tasks in industry and research and inspire the students to become future researchers / scientists with innovative ideas.

PEO3: To prepare the students for successful employment in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to handle critical situations and meet deadlines.

PEO4: To train the students in basic human and technical communication skills so that they may be good team-members, leaders and responsible citizen

PROGRAM OUTCOMES (PO's)

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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PROGRAM SPECIFIC OUTCOMES (PSO's):

PSO 1. Basic Knowledge: Apply fundamental knowledge to identify, formulate, design and investigate various problems of electrical, electronic circuits and power systems.

PSO 2. Software Tools: Apply modern software tools for design, simulation and analysis of electrical systems to engage in life- long learning and to successfully adapt in multi-disciplinary environments.

PSO 3. Electrical Engineering Problem Solved: Solve ethically and professionally various Electrical Engineering problems in societal and environmental context and communicate effectively.

PSO 4. Understand Recent Technology: Ability to understand the recent technological developments in Electrical & Electronics Engineering and develop products/software to cater the societal & Industrial needs.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES (PEO'S) WITH PROGRAMME OUTCOMES (PO'S)

A broad relation between the programme objective and the outcomes is given in the following table

Programme Educational Objectives	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
I	√	√	√	√	√				√			√
II	√	√	√	√	√	√	√	√	√	√	√	√
III		√	√			√	√	√	√	√	√	√
IV	√					√		√	√	√		

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Year	SEM	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Year 1	SEM 1	Advanced Power System Operation and Control	√	√	√									√
		Computer aided power system analysis	√	√	√	√	√						√	√
		Analysis of Power Converters	√	√	√	√							√	√
		Professional Elective - I												
		Professional Elective - II												
		Audit Course -I												
		Power System Simulation Lab- I	√	√	√	√	√				√	√		√

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**I**
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)					

Course Code	Course Name	CAT	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
P23MA102	Applied Mathematics	FC	3	0	0	3	40	60	100
P23PS101	Advanced Power System Operation and Control	PCC	3	0	0	3	40	60	100
P23PS102	Computer Aided Power System Analysis	PCC	3	0	0	3	40	60	100
P23PS103	Analysis of Power Converters	PCC	3	0	0	3	40	60	100
	Professional Elective - I	PEC	3	0	0	3	40	60	100
	Professional Elective - II	PEC	3	0	0	3	40	60	100
	Audit Course -I	AC	2	0	0	0	100	-	100
PRACTICAL									
P23PS104	Power System Simulation Lab-I	PCC	0	0	4	2	60	40	100
Total Credits						**20**	**400**	**400**	**800**

PCC – Professional Core Course, PEC – Program Elective Course, AC- Audit Course,

CA - Continuous Assessment, ESE - End Semester Examination, FC-Foundational Course

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Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING /** **ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**II**
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)					

Course Code	Course Name	CAT	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
P23PS205	Restructured Power System	PCC	3	0	0	3	40	60	100
P23PS206	Power System Transients	PCC	3	0	0	3	40	60	100
P23PS207	HVDC Transmission Systems	PCC	3	0	0	3	40	60	100
	Professional Elective - III	PCC	3	0	0	3	40	60	100
	Professional Elective -IV	PEC	3	0	0	3	40	60	100
	Audit Course -II	AC	2	0	0	0	100	-	100
PRACTICAL									
P23PS208	Power System Simulation Lab -II	PCC	0	0	3	2	60	40	100
Total Credits						**17**	**360**	**340**	**700**

PCC – Professional Core Course, PEC – Program Elective Course, AC- Audit Course,

CA - Continuous Assessment, ESE - End Semester Examination

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Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING /** **ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**III**
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)					

Course Code	Course Name	CAT	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
	Professional Elective - V	PEC	3	0	0	3	40	60	100
	Open Elective	OEC	3	0	0	3	40	60	100
PRACTICAL									
P23PS309	Project Phase - I	EEC	0	0	20	10	60	40	100
Total Credits						**16**	**140**	**160**	**300**

PEC – Program Elective Course, OEC – Open Elective Course,

EEC – Employability Enhancement Course, CA - Continuous Assessment,
ESE - End Semester Examination

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Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING /** **ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**IV**
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)					

Course Code	Course Name	CAT	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
PRACTICAL									
P23PS410	Project Phase - II	EEC	0	0	32	16	60	40	100
Total Credits						**16**	**60**	**40**	**100**

EEC – Employability Enhancement Course, CA - Continuous Assessment,
ESE - End Semester Examination

Cumulative Course Credits -69

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Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING /** **ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	-

CURRICULUM

(Applicable to the students admitted from the academic year 2023 - 2024 onwards)

PROFESSIONAL ELECTIVE-I

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE01	Power Quality	3	0	0	3	40	60	100
P23PSE02	Power System Stability	3	0	0	3	40	60	100
P23PSE03	Electrical Power Distribution Systems	3	0	0	3	40	60	100
P23PSE04	Power System Economics	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE-II								
P23PSE05	Electric and Hybrid Vehicles	3	0	0	3	40	60	100
P23PSE06	Intelligent Power Management System	3	0	0	3	40	60	100
P23PSE07	Optimization Techniques in Power System	3	0	0	3	40	60	100
P23PSE08	Power Electronics for Renewable Energy Systems	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE-III								
P23PSE09	Power System Dynamics	3	0	0	3	40	60	100
P23PSE10	Power Electronics Applications to Power Systems	3	0	0	3	40	60	100
P23PSE11	Smart Grid Technology	3	0	0	3	40	60	100
P23PSE12	Power System Security	3	0	0	3	40	60	100

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Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING /** **ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	-

CURRICULUM

(Applicable to the students admitted from the academic year 2023 - 2024 onwards)

PROFESSIONAL ELECTIVE-IV

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE13	Neuro –Fuzzy logic Controllers	3	0	0	3	40	60	100
P23PSE14	Industrial Electric Drives	3	0	0	3	40	60	100
P23PSE15	Advanced Microcontroller Based Systems	3	0	0	3	40	60	100
P23PSE16	Modeling and Analysis of Electrical Machines	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE-V								
P23PSE17	Energy conservation in Electrical systems	3	0	0	3	40	60	100
P23PSE18	Intelligent Controllers	3	0	0	3	40	60	100
P23PSE19	Distributed generation & Micro grid	3	0	0	3	40	60	100
P23PSE20	FACTS	3	0	0	3	40	60	100

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OPEN ELECTIVES (EEE)									
S.NO	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	C	**CA**	**ESE**	**Total**
1	P23PSOE1	Industrial Safety	3	0	0	3	40	60	100
2	P23PSOE2	Energy Storage Technologies	3	0	0	3	40	60	100
3	P23PSOE3	Energy Management and Auditing	3	0	0	3	40	60	100
4	P23PSOE4	Electrical circuit design for Hazardous in Industries	3	0	0	3	40	60	100

AUDIT COURSE-I

S.NO	**COURSE CODE**	**COURSE NAME**	**CATEGORY**	**L**	**T**	**P**	**C**	**Maximum Marks**		
								CA	**ESE**	**T**
1	P23AC001	Research Process and Methodologies	AC	2	0	0	0	100	0	100
2	P23AC002	Pedagogy Studies	AC	2	0	0	0	100	0	100
3	P23AC003	Disaster Management	AC	2	0	0	0	100	0	100
4	P23AC004	Value Education	AC	2	0	0	0	100	0	100
5	P23AC005	Constitution of India	AC	2	0	0	0	100	0	100

AUDIT COURSE-II

S.NO	**COURSE CODE**	**COURSE NAME**	**CATEGORY**	**L**	**T**	**P**	**C**	**Maximum Marks**		
								CA	**ESE**	**T**
1	P23AC006	English for Research Paper Writing	AC	2	0	0	0	100	0	100
2	P23AC007	Personality Development through Life Enlightenment Skills	AC	2	0	0	0	100	0	100
3	P23AC008	Universal Human Values	AC	2	0	0	0	100	0	100
4	P23AC009	Online Course	AC	2	0	0	0	100	0	100

CA - Continuous Assessment, ESE - End Semester Examination

AC- Audit Course

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Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**		
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**I**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23MA102	**Applied Mathematics**	3	0	0	3	**40**	**60**	**100**

Course Objective

The main objective of the course is to

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- Identify and demonstrate suitable sampling and data collection process.
- Identify the formulation and graphical solution of linear programming problem.
- Potentially understand forward and backward recursion.

Course Outcome

At the end of the course, the student should be able to	Knowledge Level
CO1: Apply the concept of testing of hypothesis for small and large samples in real life problems.	K1, K2,K3,K4,K5
CO2: Apply the basic concepts of classifications of design of experiments in the field of agriculture.	K1, K2,K3,K4,K5
CO3: Apply appropriate modern technology to explore probability/statistical concepts.	K1, K2,K3,K4,K5
CO4: Incorporate Transportation and Assignment problems.	K1, K2,K3,K4,K5
CO5: Recognize Dynamic programming applications using Loading method.	K1, K2,K3,K4,K5

Pre-requisites Nil

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	2	1		1								2			
CO 2	3		1		1								2			
CO 3	3	2		1									2			
CO 4	3	2	1	1	1								2			
CO 5	3	2	1	1									2			

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment and Seminar
3. End-Semester examinations

Indirect

1. Course - end survey

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Content of the syllabus			
Unit – I	**TESTING OF HYPOTHESIS**	Periods	**9**
Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.			
Unit - II	**DESIGN OF EXPERIMENTS**	Periods	**9**
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design – 2^2 factorial design.			
Unit – III	**ESTIMATION THEORY**	Periods	**9**
Sampling distributions, point estimation, unbiasedness, consistency, maximum likelihood estimation, Confidence intervals for parameter in one sample from normal population.			
Unit - III	**LINEAR PROGRAMMING**	Periods	**9**
Formulation-Graphical solution-Simplex Method -Transportation and Assignment problems			
Unit - V	**DYNAMIC PROGRAMMING**	Periods	**9**
Dynamic Programming-principle of optimality-forward and backward recursion-DP Applications (Cargo loading method)-Problems of dimensionality.			
		Total Periods	**45**

Text Books	
1.	Douglas.C; Montgomery, 'Applied Statistics and Probability for Engineers', 6th Edition, Wiley Students Edition, Wiley, 2017.
2.	Hamdy A. Taha., 'Operations Research: An Introduction', 9th Edition, Pearson New Delhi, 2014.
References	
1.	Richard. A. Johnson , Irwin Miller,' Probability And Statistics For Engineers', 8th Edition, Pearson Education, Delhi,2020.
2.	Kalyanmoy Deb., 'Optimization For Engineering Design', Phi, 2004.
3.	Kanti B. Datta., 'Mathematical Methods Of Science And Engineering', Cengage Learning, 2013.
4.	Ronald E.Walpole & Raymond H.Myers 'Probability And Statistics For Engineers And Scitintists', Pearson Education,Delhi, 9th Edition, 2014.
5.	Kothari.C.R., 'An Introduction To Operational Research' 3rd Edition, VIKAS, New Delhi, 2010.
E-Resources	
1.	https://online.stanford.edu ›
2.	www.learnerstv.com/Free-engineering-Video-lectures
3.	www.nptel.ac.in

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Elayampalayam, Tiruchengode – 637 205

Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**I**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PS101	**Advanced Power System Operation and Control**	3	0	0	3	40	60	100

Course Objective

The students should made
- To gain knowledge on various power system operation and control techniques.
- To familiarize to analyze the static and dynamic model of LFC and generation scheduling and their algorithms
- To gain knowledge to differentiate economic dispatch and unit commitment problem and understand various states of power system security

Course Outcome	At the end of the course, the student should be able to,	**Knowledge Level**
	CO1: Explain about the operation and control of power system and List the past and present status of Indian power sector	**K2**
	CO2: Analyze the static and dynamic model of Load Frequency Control in single and two area system	**K3**
	CO3: Analyze the problems associated with hydro thermal Scheduling and to construct the algorithm for feasible load management	**K2**
	CO4: Determine unit commitment and economic dispatch problems in power system network	**K2**
	CO5: Summarize the power system security and determine the system state by various methods	**K2**

Pre-requisites Power System Analysis

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3											3	3			3
CO 2	3	2	2									3	3			2
CO 3	3	2										2	3	2	3	
CO 4	3		3									3	3	3	2	2
CO 5	3	2	2									3	3			2

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II &III
2. Assignment
3. End-Semester examinations

Indirect
1. Course – end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION**	Periods	**9**
System load variation: System load characteristics, Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation and Control: Load forecasting, -Method of Extrapolation – Method of Correlation – Indian power sector– Past and present status: Recent growth of power sector in India – An overview, A time line of the Indian power sector, Players in the Indian power sector.			
Unit - II	**LOAD FREQUENCY CONTROL**	Periods	**9**
Need for frequency and voltage control - Plant and system level control - modeling of LFC of single area system - static and dynamic analysis - LFC of two area system - static and dynamic analysis - Tie line bias control - development of state variable model of single and two area system – Extension of ALFC loop to Multi area systems – Application of Optimal Control concepts in ALFC			
Unit – III	**HYDROTHERMAL SCHEDULING PROBLEM**	Periods	**9**
Hydrothermal coordination – hydro electric plant models – short term and long term scheduling problem – gradient approach – Hydro units in series – Hydro-thermal scheduling with pumped hydro plant: Scheduling of systems using Dynamic programming and linear programming.			
Unit - IV	**UNIT COMMITMENT AND ECONOMIC DISPATCH**	Periods	**9**
Statement of Unit commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems. Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ – iteration method. Gradient method – Newton's method – Base point and participation factor method. Economic dispatch controller added to LFC control.			
Unit – V	**POWER SYSTEM SECURITY**	Periods	**9**
Need for power system Security- Contingency analysis – linear sensitivity factors – AC power flow methods – contingency selection – concentric relaxation – bounding-security constrained optimal power flow-Interior point algorithm-Bus incremental costs			
		Total Periods	**45**

TEXT BOOKS	
1.	Abhijit Chakrabarti, Sunita Halder, "Power System Analysis Operation and Control", PHI Learning, PVT Ltd New Delhi 2015.
2.	Robert H. Miller, James H. Malinowski, 'Power system operation', Tata McGraw-Hill, 2009
REFERENCES	
1.	Allen J. Wood, Bruce F. Wollenberg, 'Power Generation, Operation and Control', Wiley India Edition, Second Edition, 2009. nd
2.	Olle. I. Elgerd, "Electric Energy Systems Theory – An Introduction", Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2003
3.	D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
E-RESOURCES	
1.	https://mrcet.com/downloads/digital_notes/EEE/31082020/Power%20System%20Operation%20&%20Control.pdf
2.	http://nptel.ac.in/courses/108101040/ (PSOC web course)
3.	https://scholar.google.co.in/scholar?q=state+estimation&hl=en&as_sdt=0&as_vis=1&oi=scholart

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Programme	**M.E**	Programme Code		**202**	Regulation		**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester		**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PS102	Computer Aided Power System Analysis	3	0	0	3	40	60	100

Course Objective	The students should made 1. To introduce various solution techniques to solve the large scale power systems 2. To impart in-depth knowledge on different power flow solution methods for large power system networks 3. To perform various optimal power flow methods involving operating and security constraints. 4. To perform short circuit fault analysis for various fault conditions on three phase basis. 5. To Illustrate different numerical integration methods and factors influencing transient stability	
Course Outcome	At the end of the course, the student should be able to,	**Knowledge Level**
	CO1: solve large scale simultaneous linear equations and the ordering schemes for preserving sparsity.	K2
	CO2: solve large scale power flow problems	K2
	CO3: solve optimal power flow problem using various solution methods	K2
	CO4: Do fault calculations for various fault conditions on three phase basis	K2
	CO5: Do stability studies under various disturbances using numerical integration methods	K2
Pre-requisites	Power System Analysis	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	2	2									2	3	2	2	
CO 2	3	3	2								2	2	3	2	2	
CO 3	3	3	2		2						2	2	3	2	3	
CO 4	3	2	2		2						2	2	3	2	2	2
CO 5	3	2	2	2	2						3	2	3	2	2	2

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment
3. End-Semester examinations

Indirect

1. Course - end Survey

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Content of the syllabus			
Unit – I	**SOLUTION TECHNIQUE**	**Periods**	**9**
Sparse Matrix techniques for large scale power systems - Optimal ordering schemes for preserving sparsity - Flexible packed storage scheme for storing matrix as compact arrays - Factorization by Bifactorization and Gauss elimination methods - Repeat solution using Left and Right factors and L and U matrices			
Unit - II	**POWER FLOW ANALYSIS**	**Periods**	**9**
Power flow equation in real and polar forms - Review of Newton Raphson method for solution; Adjustment of P-V buses - Review of Fast Decoupled Power Flow method - Sensitivity factors for P-V bus adjustment.			
Unit – III	**OPTIMAL POWER FLOW**	**Periods**	**9**
Problem statement - Solution of Optimal Power Flow (OPF) - The gradient method - Newton's method - Linear Sensitivity Analysis - LP methods - With real power variables only - LP method with AC power flow variables and detailed cost functions - Security constrained Optimal Power Flow - Interior point algorithm - Bus Incremental costs..			
Unit - IV	**SHORT CIRCUIT ANALYSIS**	**Periods**	**9**
Formation of bus impedance matrix with mutual coupling (single phase basis and three phase basis) - Computer method for fault analysis using ZBUS and sequence components - Derivation of equations for bus voltages -fault current and line currents - both in sequence and phase - symmetrical and unsymmetrical faults.			
Unit – V	**TRANSIENT STABILITY ANALYSIS**	**Periods**	**9**
Introduction - Numerical Integration Methods - Euler and Fourth Order Runge-Kutta methods - Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model - Factors influencing transient stability - Numerical stability and implicit Integration methods			
		Total Periods	**45**

Text Books	
1.	D. P. Kothari and I. J. Nagrath, 'Modern Power System Analysis', Fourth Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011..
2.	P. Kundur, "Power System Stability and Control", McGraw Hill, 1994..
References	
1.	A. J. Wood and B. F. Wollenberg, "Power Generation Operation and Control", John Wiley and sons, New York, 2016
2.	M. A. Pai," Computer Techniques in Power System Analysis",Tata McGraw Hill Publishing Company Limited, New Delhi, 2006.
3.	G W Stagg, A.H El. Abiad, "Computer Methods in Power System Analysis", McGraw Hill,1968
E-Resources	
1.	https://books.google.co.in/books?id=M1vjshXy3QC&printsec=copyright&redir_esc=y#v=onepage&q&f=false
2.	https://books.google.co.in/books?id=glbvBQAAQBAJ&printsec=frontcover#v=onepage&q&f=false
3.	https://e.bookpremiumfree.com/downloads/ee-601-computer-aided-power-system-analysis/

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205								
Programme	**M.E.**	Programme Code			**202**	Regulation		**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester			**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
P23PS103	**Analysis of Power Converters**	3	0	0	3	40	60	100	

Course Objective	The student should be made to, • Provide the mathematical fundamentals necessary for deep understanding of power converter operating modes. • Introduce the electrical circuit concepts behind the different working modes of power converters so as to enable deep understanding of their operation • Impart required skills to formulate and design inverters for generic load and for machine loads. • Equip with required skills to derive the criteria for the design of power converters starting from basic fundamentals. • Inculcate knowledge to perform analysis and comprehend the various operating modes of different configurations of power converters.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Acquire and apply knowledge of mathematics in power converter analysis	K2
	CO2: Model, analyze and understand power electronic systems and equipments.	K4
	CO3: Formulate, design and simulate phase-controlled rectifiers for generic load and for machine loads	K4
	CO4: Design and simulate switched mode inverters for generic load and for machine loads	K2
	CO5: Select device and calculate performance parameters of power converters under various operating modes	K3
Pre-requisites	-	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

	Programme Outcomes (POs)												PSOs			
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3	2	2	2	-	-	-	-	-	-	2	2	2	2	2	-
CO 2	3	2	2	2	-	-	-	-	-	-	2	2	2	2	2	-
CO 3	2	2	2	2	-	-	-	-	-	-	2	2	2	2	2	-
CO 4	2	2	2	2	-	-	-	-	-	-	2	2	2	2	2	-
CO5	2	2	2	2	-	-	-	-	-	-	2	2	2	2	2	

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment
3. End-Semester examinations

Indirect

1.Course - end survey

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Content of the syllabus			
Unit – I	**SINGLE PHASE AC-DC CONVERTER**	Periods	**9**
Static Characteristics of power diode, SCR and GTO, half controlled and fully controlled converters with R-L, R-L-E loads and freewheeling diodes – continuous and discontinuous modes of operation - inverter operation and its limit –Sequence control of converters – performance parameters – effect of source impedance and overlap-reactive power and power balance in converter circuit.			
Unit - II	**THREE PHASE AC-DC CONVERTER**	Periods	**9**
Half controlled and fully controlled converters with R, R-L, R-L-E loads and freewheeling diodes – inverter operation and its limit – performance parameters – effect of source impedance and overlap - 12 pulse converter –Applications - Excitation system, DC drive system.			
Unit – III	**SINGLE PHASE INVERTERS**	Periods	**9**
Introduction to self-commutated switches: MOSFET and IGBT - Principle of operation of half and full bridge inverters – Performance parameters – Voltage control of single-phase inverters using various PWM techniques – various harmonic elimination techniques – Design of UPS - VSR operation			
Unit - IV	**THREE PHASE INVERTERS**	Periods	**9**
180 degree and 120-degree conduction mode inverters with star and delta connected loads – voltage control of three phase inverters: single, multi pulse, sinusoidal, space vector modulation techniques – VSR operation-Application – Induction heating, AC drive system – Current source inverters.			
Unit – V	**MODERN INVERTERS**	Periods	**9**
Multilevel concept – diode clamped – flying capacitor – cascaded type multilevel inverters - Comparison of multilevel inverters - application of multilevel inverters – PWM techniques for MLI – Single phase &Three phase Impedance source inverters – Filters.			
		Total Periods	**45**

Text Books	
1.	Rashid M.H., “Power Electronics Circuits, Devices and Applications ", Pearson, fourth Edition, 10th Impression 2021.
2.	Jai P. Agrawal, “Power Electronics System Theory and Design”, Pearson Education, First Edition, 2015
3.	Bimal.K.Bose “Modern Power Electronics and AC Drives”, Pearson Education, Second Edition, 2003
References	
1	Ned Mohan, T.M.Undeland and W.P.Robbins, “Power Electronics: converters, Application and design”, 3rd edition Wiley, 2007
2	Philip T. Krein, “Elements of Power Electronics” Indian edition Oxford University Press-2017
3	Bin Wu, Mehdi Narimani, "High-Power Converters and AC Drives", Wiley, 2nd Edition, 2017.
4	P.S.Bimbra, “Power Electronics”, Khanna Publishers, Eleventh Edition, 2003
5	P.C.Sen, “Modern Power Electronics”, S.Chand Publishing 2005.

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN **(Autonomous Institution, Affiliated to Anna University ,Chennai)** **Elayampalayam, Tiruchengode – 637 205**								
Programme	**M.E.**	Programme Code			**202**	Regulation			**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester				**I**
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
P23PS104	**Power System Simulation lab -I**	**0**	**0**	**4**	**2**	**60**	**40**	**100**	
Course Objective	The students should made to • present a problem-oriented knowledge of power flow analysis methods • Understand the concept of economic dispatch problems solution by using software. • Understand the Concept of Converters								
Course Outcome	At the end of the course, the student should be able to,							Knowledge Level	
	CO1: Analysis the different methods of load flow problems by simulation.							K4	
	CO2: Analysis Transient stability analysis of power system by using simulink model.							K4	
	CO3: Analysis the economic dispatch problem and Unit Commitment							K4	
Pre-requisites	Nil								

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak												**CO/PSO Mapping**			
COs	Programme Outcomes (POs)											PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3	2	3	2	2	1						2	3		3	
CO 2	2	3	3	2	2				1			2	2		3	1
CO 3	3	2	3	2	2					1		2	3		3	
CO 4																
CO 5																

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Direct
1. Pre lab &Post lab test 2. End-Semester examinations
Indirect
1. Course - end survey

Content of the syllabus

Experiments	Course Outcome
1. Power flow analysis by Gauss Seidal method.	CO 1
2.Power flow analysis by Newton-Raphson/ Fast decoupled method	CO 1
3. Transient stability analysis of single machine-infinite bus system using classical machine model	CO 2
4. Economic load dispatch using lambda-iteration method	CO 3
5. Unit commitment: Priority-list scheme and dynamic programming	CO 3
6. Contingency analysis: Generator shift factors and line outage distribution factors	CO 1
7. Load flow analysis of two-bus system with STATCOM	CO 1
8. Simulation of IGBT Inverters.	CO 2
9.Simulation of Thyristor Converters	CO 2
10. Short Circuit Studies.	CO 2
	Total period : 45

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205.							
Programme	**M.E.**	Programme Code		**202**	Regulation		**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester		**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE01	**Power Quality**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the Power quality standards. • Understand the Electrical power quality issues. • Analysis of various PQ issues. • Understand the Methods to improve power quality • Understand the Reduction of PQ problems using custom power devices and harmonic filters.	
Course Outcome	At the end of the course, the student should be able to,	**Knowledge Level**
	CO1: Understand various sources, causes and effects of power quality issues, electrical systems and their measures and mitigation.	K2
	CO2: Analyze the causes & Mitigation techniques of various PQ events. .	K3
	CO3: Understand the concepts about Voltage and current distortions, harmonics.	K3
	CO4: Analyze and design the passive filters.	K4
	CO5: Acquire knowledge on compensation techniques.	K5
Pre-requisites	Protection and Switchgear	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 – Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	2	2	2	2		2	1			3	2	1	3		2	
CO 2	3	3	3	2						2	1		3		2	
CO 3	3	3		3		2					2	2	2	3	1	2
CO 4	3	3		3			2	2				2	2	3		2
CO 5		3	2		1			1				1		3		3

Direct

1. Continuous Assessment Test I, II & III
2. Assignment
3. End-Semester examinations

Indirect

1. Course - end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION**	Periods	**9**
Electric power quality phenomena- IEC and IEEE definitions – power quality disturbances-voltage fluctuations- transients-unbalance-waveform distortion-power frequency variations, DC offset in loads, Notching in load voltage			
Unit – II	**SAGS AND INTERRUPTIONS**	Periods	**9**
Voltage variations, Voltage sags and short interruptions – flicker- longer duration variations – sources range and impact on sensitive circuits-standards – solutions and mitigations – equipment and techniques.			
Unit – III	**TRANSIENTS AND PROTECTION**	Periods	**9**
Transients – origin and classifications – capacitor switching transient – lightning-load switching – impact on users – protection – mitigation.			
Unit – IV	**HARMONICS**	Periods	**9**
Harmonics – sources – definitions & standards – impacts – calculation and simulation – harmonic power flow – mitigation and control techniques – filtering – passive and active.			
Unit – V	**APPLICATIONS**	Periods	**9**
Power Quality conditioners – shunt and series compensators-D Statcom–Dynamic voltage restorer unified power quality conditioners-case studies.			
		Total Periods	**45**

Text Books	
1.	Roger. C. Dugan, Mark. F. Mc Granagham, Surya Santoso, H.WayneBeaty, ―Electrical Power Systems Quality‖, McGraw Hill,2003.
2.	Arindam Ghosh ,Power Quality Enhancement Using Custom Power Devices‖, Kluwer Academic Publishers, 2002.
References	
1.	Heydt, G.T., Electric Power Quality‟, Stars in a Circle Publications, Indiana,2nd edition 1994.
2.	J. Arrillaga, N.R. Watson, S. Chen, ―Power System Quality Assessment‖, (New York: Wiley),2000.
3.	Math H.J.Bollen, Understanding Power Quality Problems: Voltage Sags and Interruptions‖, IEEE Press, New York, 2000.
4.	Barry W.Kennedy: Power Quality Primer, McGraw-Hill, New York, 2000.
E-Resources	
1.	http://www.powerqualityworld.com/2011/09/handbook-power-quality-free-ebook.html
2.	http://www.idc-online.com/technical references/pdfs/electrical engineering/Types and Revolution of Electrical.pdf
3.	https://books.google.co.in/books/about/Electrical_Power_Quality_Control_Techniq.html?id=6xRfcCNvTiYC&redir_esc=y

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E**	Programme Code		**202**	Regulation		**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester		**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE02	**POWER SYSTEM STABILITY**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Impart knowledge on mathematical modeling of a synchronous machine. • Offer an opportunity to innovate newer procedures and better methods for effective design. • Provide knowledge on enhancing small signal stability concepts in power system.	
Course Outcome	At the end of the course, the student should be able to,	**Knowledge Level**
	CO1: Gain a deep understanding on power system modeling for stability analysis.	K2
	CO2: Gain a deep understanding of power system behavior under transient condition	K2
	CO3: Analyze the performance of single and multi-machine systems under transient, steady state and dynamic conditions.	K2
	CO4: Analyze the factors effect voltage stability and analysis of factors and solutions of control of voltage instability	K2
	CO5: Analyze the various Methods of improving stability	K2
Pre-requisites	Power System Transients	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	2										2	3	2	2	
CO 2	3	3	2		2							2	3	2	2	
CO 3	3	3	2		2							2	3	2	3	
CO 4	3	2		2	2							2	3	2	2	2
CO 5	3	2		2	2							2	3	2	2	2

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment 3. End-Semester examinations
Indirect
1. Course - end Survey

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Content of the syllabus			
Unit – I	**POWER SYSTEM STABILITY CONSIDERATIONS**	**Periods**	**9**
Introduction-Stability classifications -rotor angle and voltage stability- synchronous machine representation –classical model-load modeling concepts-modeling of excitation systems modeling of prime movers..			
Unit - II	**TRANSIENT STABILITY**	**Periods**	**9**
Swing equation-equal area criterion-solution of swing equation-Numerical methods -Euler method-Runge-Kutta method-critical clearing time and angle-effect of excitation system and governors-Multi machine stability -transient energy function approach- Application of TSA to SMIB system			
Unit – III	**SMALL SIGNAL STABILITY**	**Periods**	**9**
State space representation – Eigen values- modal matrices-small signal stability of single machine infinite bus system – synchronous machine classical model representation-effect of field circuit dynamics-effect of excitation system-small signal stability of multi machine system.			
Unit - IV	**VOLTAGE STABILITY**	**Periods**	**9**
Generation aspects - transmission system aspects – load aspects – PV curve – QV curve – PQ curve – analysis with static loads – load ability limit - sensitivity analysis-continuation power flow analysis - instability mechanisms-examples.			
Unit – V	**STABILTY IMPROVEMENT**	**Periods**	**9**
Methods of improving stability – transient stability enhancement – high speed fault clearing – steam turbine fast valving-high speed excitation systems- small signal stability enhancement power system stabilizers – voltage stability enhancement – reactive power control			
		Total Periods	**45**

Text Books	
1.	Kundur, P., "Power System Stability and Control", McGraw-Hill International Editions, 1994.
2.	Anderson, P.M. and Fouad, A.A., "Power System Control and Stability", Galgotia Publications, New Delhi, 2003.
References	
1.	Kimbark EW. "Power system stability-III, synchronous machines", John Wiley & Sons
2.	Taylor C.W. "Power systems voltage stability", TMH
3.	K.R. Padiyar, "Power systems Dynamics stability and control", Interline publishing pvt., ltd., Bangalore
E-Resources	
1.	https://www.electrical4u.com/power-system-stability/
2.	https://circuitglobe.com/voltage-stability-in-power-system.html
3.	https://www.electricaleasy.com/2021/02/power-system-stability.html

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205

Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**I**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE03	**Electrical Power Distribution Systems**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Understand the distribution system expansion planning and reliability analysis procedures.
- Analyze the types of load and their characteristics.
- Understand the protection in distribution system.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Students will be able to do loss calculation in distribution lines , select the protective components, planning and reliability analysis	K1
	CO2: Differentiate the types of loads and their characteristics	K2
	CO3: Calculate the voltage drop and power loss in a distribution system.	K2
	CO4: Recognize the necessity of distribution system protection and devices available for discriminating faults	K2
	CO5: Design a suitable capacitance for voltage control in a distribution System	K2

Pre-requisites: Power System Analysis, Electrical Power Distribution Systems

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	2	1	2	1				1				1	2		2	
CO 2	2	1	2	1				1				1	2		2	
CO 3	2	1	2	1				1				1	2		2	
CO 4	2	2	2	1				1				1	2		2	
CO 5	2	2	2	1				1				1	2		2	

Direct

1. Continuous Assessment Test I, II & III
2. Assignment
3. End-Semester examinations

Indirect

1. Course - end survey

Signature of the BOS Chairman, EEE

Content of the syllabus			
Unit – I	**GENERAL CONCEPTS**	Periods	**9**
Industrial and commercial distribution systems – Energy losses in distribution system – system ground for safety and protection – comparison of O/H lines and underground cable system .Network model – power flow, short circuit and loss calculations.			
Unit - II	**RELIABILITY ANALYSIS**	Periods	**9**
Distribution system, reliability analysis – reliability concepts – Markov model – distribution network reliability – reliability performance			
Unit – III	**DISTRIBUTION SYSTEM PLANNING**	Periods	**9**
Distribution system expansion -planning – load characteristics – load forecasting – design concepts – optimal location of substation – design of radial lines – solution technique.			
Unit - IV	**VOLTAGE CONTROL OF DISTRIBUTION SYSTEM**	Periods	**9**
Voltage control – Application of shunt capacitance for loss reduction – Harmonics in the system – static VAR systems –loss reduction and voltage improvement.			
Unit – V	**DISTRIBUTION SYSTEM PROTECTION**	Periods	**9**
System protection – requirement – fuses and section analyzers-over current. Under voltage and under frequency protection – coordination of protective device.			
		Total Periods	**45**

Text Books	
1.	Turan Gonen, "Electric Power Distribution Engineering ",3rd Edition, CRC Press,2014
2.	James A. Momoh, "Electric Power Distribution, Automation, Protection, and Control" 1st Edition, CRC Press,2007
References	
1.	Pabla, A.S., "Electrical Power Distribution System", 5th edition,Tata McGraw hill, 2004.
2.	Tuvar Goner, "Electrical Power Distribution System Engineering", McGraw hill, 1986.
3.	Sterling, M.I.H., " Power System Control", Peter Peergisus, 2006
4.	Cooper, "Electrical Distribution System Protection "1st edition, 2005
5.	Abdelhay A. Sallam "Electric Distribution Systems" 2nd edition, CRC Press, 2014
E-Resources	
1.	https://nptel.ac.in/courses/108107112/
2.	https://epdf.pub/electric-power-distribution-system-engineering.html
3.	http://tnebes.org/archive/2019/May19/safetymanual%20.pdf
4.	http://students.aiu.edu/submissions/profiles/resources/onlineBook/Z7e5T7_Electric_Power_Distribution_Engineering-_Third_Edition.pdf

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205						
Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**		
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**I**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE04	**Power System Economics**	3	0	0	3	40	60	100

Course Objective	The students should made to • Understand the basic concept of economics in electrical energy • Understand the transmission networks, system networks and ancillary services • Understand the generation system characteristics	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Evaluate the market competition	K5
	CO2: Analyze the electricity power market	K4
	CO3: Identify the transmission losses and pricing	K3
	CO4: Evaluate system networks and ancillary services	K5
	CO5: Evaluate the power system economic planning ,Load forecasting and system reliability	K5
Pre-requisites	Generation of Electrical Energy, Power System Operation and Control	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**			
COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	2				3		2				3	3			3
CO 2	3	2				3		2				3	3			3
CO 3	3	2				3		2				3	3			3
CO 4	3	2				3		2				3	3			3
CO 5	3	3				3		2				3	3			3

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment
3. End-Semester examinations

Indirect

1. Course - end survey

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Content of the syllabus			
Unit – I	**BASIC CONCEPTS FROM ECONOMICS**	**Periods**	**9**
Introduction - Fundamentals of Markets- Concepts from the Theory of the Firm- Types of Markets, Forward contracts and forward markets, Future contracts and futures markets, Managing the price risks, Market efficiency - Markets with Imperfect Competition.			
Unit – II	**MARKETS FOR ELECTRICAL ENERGY**	**Periods**	**9**
Introduction- Need for a Managed Spot Market- Open Electrical Energy Markets-Bilateral trading- Electricity pools- Comparison of pool and bilateral trading- Managed Spot Market , Obtaining balancing resources , Gate closure , Operation of the managed spot market , Interactions between the managed spot market and the other markets			
Unit – III	**TRANSMISSION NETWORKS AND ELECTRICITY MARKETS**	**Periods**	**9**
Introduction- Decentralized Trading Over a Transmission Network- Physical transmission rights- Problems with physical transmission rights- Centralized Trading Over a Transmission Network, Centralized trading in a two-bus system, Centralized trading in a three-bus system, Losses in transmission networks, Mathematical formulation of nodal pricing, Managing transmission risks in a centralized trading system.			
Unit – IV	**SYSTEM SECURITY AND ANCILLARY SERVICES**	**Periods**	**9**
Introduction-Describing the Needs, Balancing issues-Network issues-System restoration-Obtaining Ancillary Services, Compulsory provision of ancillary services, Market for ancillary services, Demand-side provision of ancillary services-Buying Ancillary Services, Quantifying the needs, Co-optimization of energy and reserve in a centralized electricity market, Allocating the costs-Selling Ancillary Services.			
Unit – V	**GENERATION SYSTEM CHARACTERISTICS, COST AND RELIABILITY ANALYSIS**	**Periods**	**9**
Characteristic operation of power plants- choice of power plants- hydro, thermal and nuclear- size of plant- input/ output curves. Economic planning – generation system- cost analysis. Load forecasting and system reliability: load forecasting-generation system reliability – co-ordination methods- economic operation of power systems- simple problems.			
		Total Periods	**45**

Text Books	
1.	Daniel S. Kirschen, Goran Strbac, "Fundamentals of Power System Economics", 2Nd Edition,2004
2.	Mohammad Shahidehpour, Hatim Yamin, Zuyi Li, **"**Market Operations in Electric Power Systems: Forecasting, Scheduling and Risk Management‖, Wiley-IEEE Press; 1st edition 2002
References	
1.	RR Barathwal "Industrial Economics- an introductory ",2007
2.	Steven Soft, "Power System Economics", Wiley-IEEE Press; 1st edition ,2002
E-Resources	
1.	https://cds.cern.ch/record/1607317/files/9780470845721_TOC.pdf
2.	https://ecal.berkeley.edu/files/ene2xx/Readings/Kirschen-TransmissionNetworksElectricMarkets.pdf
3.	https://www.fayoum.edu.eg/stfsys/stfFiles/243/2512/Ch%204%20%20Principles%20of%20Power%20system.pdf

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E.**	Programme Code			**202**	Regulation	**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester		**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE05	**Electric and Hybrid Vehicles**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the concept of fundamentals of electrical drives. • Analysis of electric vehicles. • Design of hybrid and electric vehicles with the HVDC converters and their control system.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Select appropriate source of energy for the hybrid electric vehicle based on Driving cycle.	K2
	CO2: Applying the concepts of topologies of power flow controllers.	K3
	CO3: Measure and Estimate the energy consumption of the Hybrid Vehicles	K4
	CO4: Design the concepts the configuration and control of various hybrid electric motor drives	K6
	CO5: Modeling and Plan and design appropriate vehicle management system.	K6
Pre-requisites	-	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	3	1	1	-	-	1	-	-	2	2	2	1	1	1
CO 2	3	2	3	1	2	-	-	1	-	-	2	2	2	1	1	1
CO 3	3	3	3	1	2	-	-	1	-	-	2	3	2	1	1	1
CO 4	3	2	3	1	1	-	-	1	-	-	2	3	2	1	1	1
CO5	3	3	3	1	1	-	-	1	-	-	2	3	2	1	1	1

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment
3. End-Semester examinations

Indirect

1.Course - end survey

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Content of the syllabus

Unit – I	**INTRODUCTION**	Periods	**9**

History of hybrid and electric vehicles, Types of Electric Vehicles, social and environmental importance of hybrid electric vehicles, impact of modern drive-trains on energy supplies. Basics of vehicle performance, vehicle power source characterization, transmission characteristics and mathematical models to describe vehicle performance.

Unit - II	**TOPOLOGIES**	Periods	**9**

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concepts of electric traction, introduction to various electric drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Unit – III	**ELECTRIC DRIVES**	Periods	**9**

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives. Configuration and control of Introduction Motor drives, configuration and control of Permanent Magnet Motor drives, drive system efficiency.

Unit - IV	**ELECTRIC HYBRID VEHICLES**	Periods	**9**

Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems. Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Hybridization of different energy storage devices.

Unit – V	**ENERGY MANAGEMENT STRATEGIES**	Periods	**9**

Introduction to energy management strategies used in hybrid electric vehicle, classification and comparison of different energy management strategies, implementation issues of energy strategies. Introduction to various charging techniques and schematic of charging stations.

	Total Periods	**45**

Text Books

1.	Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2.	Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

References

1.	S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies",Springer, 2015.
2.	Siew-Chong Tan, Yuk-Ming Lai, Chi Kong Tse, _Sliding mode control of switching Power Converters', CRC Press, 2011
3.	Sira -Ramirez, R. Silva Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer,2006
4.	Ion Boldea and S.A Nasar, "Electric drives", CRC Press, 2005
5.	Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, 2003.

E-Resources

1.	https://www.bharathuniv.ac.in/colleges1/downloads/courseware_eee/Notes/CE3/BEE033%20E&HV.pdf
2.	https://nptel.ac.in/course.html
3.	https://www.eng.mcmaster.ca/mech/content/electric-and-hybrid-vehicles
4.	https://afdc.energy.gov/vehicles/how-do-hybrid-electric-cars-work

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E.**	Programme Code		**202**	Regulation		**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester			**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE06	**Intelligent Power Management System**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Provide knowledge about various renewable energy technologies • Enable students to understand and design a PV system. • provide knowledge about wind energy system. Provide knowledge about various possible hybrid energy systems • Gain knowledge about application of various renewable energy technologies	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Attained knowledge about various renewable energy technologies.	K2
	CO2: Ability to understand and design a PV system.	K3
	CO3: Understand the concept of various wind energy system.	K3
	CO4: Gained knowledge about various possible hybrid energy systems.	K2
	CO5: Attained knowledge about various applications of renewable energy technologies.	K3
Pre-requisites	Power Electronics, Generation, Transmission & Distribution	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	1	2	1	2							2	3	2	1	2
CO 2	3	2	3	2	2							2	3	2	1	2
CO 3	3	2	3	2	2							2	3	2	1	2
CO 4	3	2	3	2	2							2	3	2	1	1
CO 5	3	2	3	2	1							2	3	1	1	1

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment 3. End-Semester examinations
Indirect
1. Course - end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION**	**Periods**	**9**
Primary energy sources, renewable vs. non-renewable primary energy sources, renewable energy resources in India, Current usage of renewable energy sources in India, future potential of renewable energy in power production and development of renewable energy technologies.			
Unit - II	**SOLAR ENERGY**	**Periods**	**9**
Solar Radiation and its measurements, Solar Thermal Energy Conversion from plate Solar Collectors, Concentrating Collectors and its Types , Efficiency and performance of collectors, Applications of Solar Thermal Energy use of low and medium, high temperature and recent advances in industry and buildings. Direct Solar Electricity Conversion from Photovoltaic, types of solar cells and its application of battery charger, domestic lighting, street lighting, and water pumping, power generation schemes. Recent Advances in PV Applications: Building Integrated PV, Grid Connected PV Systems, Hybrid Systems and Solar Cars, Solar Energy Storage system and their economic aspects.			
Unit – III	**WIND ENERGY**	**Periods**	**9**
Wind energy principles, wind site and its resource assessment, wind assessment, Factors influencing wind, wind turbine components, wind energy conversion systems (WECS), Classification of WECS devices, wind electric generating and control systems, characteristics and applications. Hybrid systems - safety and environmental aspects, economic aspects.			
Unit - IV	**BIO-ENERGY**	**Periods**	**9**
Energy from biomass, Principle of biomass conversion technologies/process and their classification, Bio gas generation, types of biogas plants, selection of site for biogas plant, classification of biogas plants, Advantage and disadvantages of biogas generation, thermal gasification of biomass, biomass gasifies, Application of biomass and biogas plants and their economics.			
Unit – V	**OTHER TYPES OF ENERGY**	**Periods**	**9**
Energy conversion from Hydrogen and Fuel cells, Geo thermal energy Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, minihydel power plants and their economics.			
		Total Periods	**45**
Text Books:			
1.	Twidell & Wier,**'**Renewable Energy Resources' CRC Press(Taylor & Francis).		
2.	D.P.Kothari,K.C.Singhal,'Renewable energy sources and emerging technologies', P.H.I.		
References:			
1.	Tiwari and Ghosal/ Narosa,'Renewable energy resources'.		
2.	D.S.Chauhan, S.K. Srivastava, 'Non – Conventional Energy Resources', New Age Publishers, 2006.		
3.	B.H.Khan, 'Non – Conventional Energy Resources', Tata Mc Graw Hill, 2006.		
E-Resources:			
1.	https://nptel.ac.in/courses/103103206		
2.	https://www.youtube.com/watch?v=cZSYukWvpsE		
3.	https://mrcet.com/downloads/digital_notes/ME/IV%20year/Renewable%20Energy%20Sources.pdf		
4.	https://www.brainkart.com/subject/Renewable-Energy-Systems_354/		

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205.					
Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester	**I**	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE07	**Optimization Techniques in Power System**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Learn the difference between optimal reasoning Vs human like reasoning
- Understand the concepts of artificial neural networks
- Learn different knowledge representation techniques
- Understand the concepts of optimization techniques.
- Learn General Design Methodology for Neuro-Fuzzy Systems Analyze the applications of AI techniques to Electrical Engineering

Course Outcome	At the end of the course, the student should be able to,	**Knowledge Level**
	CO1: Analyze and design knowledge based systems intended for computer implementation of optimization techniques	K2
	CO2: Realize the concepts of Genetic Algorithms and PSO	K3
	CO3: Realize the concepts of ACO and ABC Algorithms.	K3
	CO4: Able to realize the concepts of optimization based on Shuffled frog-leaping and BAT algorithms	K4
	CO5: Apply Multi objective optimization techniques to real-world problems.	K5

Pre-requisites	Power System Operation and Control

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 – Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2	2
CO 2	3	3	3	3	2					1	1	2	3	3	1	2
CO 3	3	3	3	3	2					1	1	2	2	3	1	2
CO 4	3	3	3	3	2					1	1	2	2	3	1	2
CO 5	3	3	3	3	2	2	2	1		2	1	2	2	3	2	2

Direct

1. Continuous Assessment Test I, II & III
2. Assignment
3. End-Semester examinations

Indirect

1. Course - end survey

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Content of the syllabus

Unit – I	FUNDAMENTALS OF SOFT COMPUTING TECHNIQUES	Periods	9

Definition-Classification of optimization problems-Unconstrained and Constrained optimization Optimality conditions- Introduction to intelligent systems–Soft computing techniques-Conventional Computing versus Swarm Computing – Classification of meta–heuristic techniques– Single solution based and population based algorithms – Exploitation and exploration in population based algorithms – Properties of Swarm intelligent Systems – Application domain – Discrete and continuous problems – Single objective and multi objective problems.

Unit – II	GENETIC ALGORITHM AND PARTICLE SWARM OPTIMIZATION	Periods	9

Genetic algorithms – Genetic Algorithm versus conventional Optimization Techniques–Genetic representations and selection mechanisms; Genetic operators- different types of crossover and mutation operators – Bird flocking and fish Schooling – anatomy of a particle- equations based on velocity and positions –PSO topologies – control parameters – GA and PSO algorithms for solving ELD problem without loss, Selective Harmonic Elimination in inverters and PI controller tuning.

Unit – III	ANT COLONY OPTIMIZATION AND ARTIFICIAL BEE COLONY ALGORITHMS	Periods	9

Biological ant colony system – Artificial ants and assumptions – Stigmergic communications – Pheromone updating – local global–Pheromone evaporation–ant colony system–ACO models–Touring ant colony system-max min ant system–Concept of Elitist Ants–Task partitioning in honey bees Balancing foragers and receivers –Artificial bee colony (ABC) algorithms–binary ABC algorithms -ACO and ABC algorithms for solving Economic Dispatch without loss and PI controller tuning.

Unit – IV	SHUFFLED FROG-LEAPING ALGORITHMS AND BAT OPTIMIZATION ALGORITHM	Periods	9

Bat Algorithm-Echolocation Of bats – Behavior of micro bats – Acoustics of Echolocation- Movement of Virtual Bats – Loudness and Pulse Emission – Shuffled frog algorithm-virtual population of frogs comparison of memes and genes – memeplex formation – memplex updation – BA and SFLA algorithms for solving ELD without loss and PI controller tuning.

Unit – V	MULTI OBJECTIVE OPTIMIZATION	Periods	9

Multi-Objective optimization introduction-Concept of Pareto optimality – Non-dominant sorting technique-Pareto fronts-best compromise solution-min max method-NSGA-II Algorithm and application To general two objective optimization problems.

Total Periods	**45**

Text Books

1.	Xin-she Yang, "Recent Advance in Swarm Intelligence and Evolutionary Computation", Springer International Publishing, Switzerland, 2015.
2.	Kalyanmoy Ded, "Multi-Objective Optimization using Evolutionary Algorithms", John Wiley & Sons, 2001.
3.	James Kennedy and Russel E Eberheart, "Swarm Intelligence", the Morgan Kaufmann Series in Evolutionary Computation, 2001

References

1.	Eric Bonabeau, Macro Dorigo and Guy Theraulaz, "Swarm Intelligence- From natural to Artificial Systems", Oxford universityPress,1999.
2.	David Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Pearson Education,2007.
3.	Konstantinos E. Parsopoulos and Michael N. Vrahatis, "Particle Swarm Optimization and Intelligence: Advances and Applications", Information science Reference Books,IGIGlobal,,2010.
4.	N P Padhy,"Artificial Intelligence and Intelligent Systems", Oxford University Press,2005.

E-Resources

1.	Optimization of Power system operation, Jizhong Zhu, Willy publication, Second edition, 2015
2.	Modern Optimization Techniques with Applications in Electric Power Systems, Soliman Abdel-Hady Soliman, Abdel-Aal Hassan Mantawy, Springer, 2015
3.	Optimization Methods Applied to Power Systems, Volume 1 & 2, Francisco G. Montoya Ra´ul Ba˜nos Navarro, MDPI, 2018

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E.**	Programme Code			**202**	Regulation	**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester		**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23PSE08	**Power Electronics for Renewable Energy Systems**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • To provide knowledge about different types of renewable energy systems. • To analyze the various power converters used in solar energy systems. • To analyze the electrical generator used for wind energy systems • To analyze power converters used for wind energy conversion systems. • To understand the importance hydro power and its working.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Analyze the impacts of renewable energy technologies on the environment and demonstrate them to harness electrical power	K2
	CO2: Design the power converters such as AC-DC, DC-DC, and AC-AC converters for Solar energy systems.	K4
	CO3: Select a suitable Electrical machine for Wind Energy Conversion Systems.	K4
	CO4: Design the power converters for Wind energy systems.	K2
	CO5: Analyze the impacts of Hydro Electric Power plant and its elements.	K2
Pre-requisites	-	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

COs	Programme Outcomes (POs)												PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	3	3	3	2	2	-	-	-	-	2	2	3	2	1	1	-
CO 2	3	2	3	2	2	-	-	-	-	2	2	3	2	1	1	-
CO 3	3	2	3	2	2	-	-	-	-	2	2	3	2	1	1	-
CO 4	3	2	3	2	2	-	-	-	-	2	2	3	2	1	1	-
CO5	3	2	3	2	2	-	-	-	-	2	2	3	2	1	1	-

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment
3. End-Semester examinations

Indirect

1.Course - end survey

Signature of the BOS Chairman, EEE

Content of the syllabus			
Unit – I	**INTRODUCTION TO RENEWABLE ENERGY SYSTEMS**	Periods	**9**
Classification of Energy Sources – Importance of Non-conventional energy sources – Advantages and disadvantages of conventional energy sources – Environmental aspects of energy – Impacts of renewable energy generation on the environment – Qualitative study of renewable energy resources: Ocean energy, Biomass energy, Hydro energy, - Solar Photovoltaic (PV), Fuel cells: Operating principles and characteristics, Wind Energy: Types, control strategy, operating area Wind Turbine types-Rotor Selection-Rotor design considerations- Tip speed ratio-No. of Blades-Blade profile			
Unit - II	**POWER CONVERTERS AND ANALYSIS OF SOLAR PV SYSTEMS**	Periods	**9**
Review of reference theory fundamentals –Construction, Principle of operation and analysis: Squirrel Cage Induction Generator (SCIG), Doubly Fed Induction Generator (DFIG) – Permanent Magnet Synchronous Generator (PMSG).			
Unit – III	**ELECTRICAL MACHINES FOR WIND ENERGY CONVERSION SYSTEMS (WECS)**	Periods	**9**
Solar PV Systems: Solar PV characteristics, Grid requirement for PV, Power electronic converters used for solar PV, Control techniques, MPPT, Grid connected and Islanding mode, Grid synchronization, PLLs, battery charging in PV systems.			
Unit - IV	**POWER CONVERTERS AND ANALYSIS FOR WIND SYSTEMS**	Periods	**9**
Introduction to Hydro Power Energy Need for hydropower energy and its power estimation -Block diagram of Small Hydro Power Station. Dam, Details of desilting tank. Storage & Balancing reservoir. Pen Stock, Pipe Line & Tunneling. Surge Tank, Valve House, Turbines. Synchronous Generator. Protection & Control equipment-Synchronous Generator & its Construction, working, types- SCADA- Supervisory control and data acquisition, ICCS-Integrated computer control system.			
Unit – V	**ANALYSIS OF HYDRO POWER**	Periods	**9**
Stand-alone operation of fixed and variable speed WECS-Grid integrated SCIG and PMSG based WECS, Control techniques -V/f control and self-control of synchronous motor: Margin angle control and power factor control – permanent magnet synchronous Motor-Three phase voltage/current source fed synchronous motor.			
	Total Periods		**45**

Text Books	
1.	Suleiman M. Sharkh, Mohammad A. Abu-Sara, Georgios I. Orfanoudakis, Babar Hussain, "Power Electronic Converters for Microgrids" Wiley-IEEE Press, April 2014.
2.	Fang Lin Luo, Hong Ye, "Advanced DC/AC Inverters: Applications in Renewable Energy" CRC Press.
3.	Sudipta Chakraborty, Marcelo G. Simões, William E. Kramer, "Power Electronics for Renewable and Distributed Energy Systems" Springer 2013.
4.	Remus Teodorescu, Marco Liserre, Pedro Rodriguez, "Grid Converters for Photovoltaic and Wind Power Systems" Wiley-IEEE Press, January 2011.
References	
1.	B.H.Khan "Non-conventional Energy sources ",Tata McGraw-hill Publishing Company, New Delhi, 2017.
2.	Rai. G.D, "Non-conventional energy sources", Khanna publishers, 2010
3.	S.N. Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford University Press, 2009
4.	Rashid. H "Power electronics Hand book", Academic press,2nd Edition, 2006.

E-Resources	
1.	https://rmd.ac.in/dept/eee/sp/8/PERES/unit2.pdf
2.	https://www.powerelectronics.com/
3.	https://www.energy.gov/energysaver/grid-connected-renewable-energy-systems

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205

Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**		Semester		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC001	**Research Process and Methodologies**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- To understand the importance of Research
- To acquire knowledge in Data Collection and Analysis
- To effectively write reports

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1:Understand research problem types and data collection methods.	K2
	CO2:Understand research design methodologies	K2
	CO3:Analyze research related information	K4
	CO4:Follow research ethics	K2
	CO**5:**Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.	K2

Pre-requisites --

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Cos	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	3	3	2									2			
CO 2	3	3	3	2					2				2		2	
CO 3	3	3	3	2					2				1		1	1
CO 4	3	3	3	2					2				1		1	1
CO 5	3	3	3	2									1		2	1

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment and Seminar

Indirect

1. Course - end survey

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Content of the syllabus			
Unit - I	**INTRODUCTION TO RESEARCH**	Periods	**9**
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research Meaning of Research- Types of Research- Research Process- Problem definition- Objectives of Research- Research design- Approaches to Research- Quantitative vs. Qualitative Approach- Research Methods versus Methodology -Research and Scientific Method-Research Process-Criteria of Good Research.			
Unit – II	**RESEARCH DESIGN**	Periods	**9**
Meaning of Research Design-Need for Research Design- Features of a Good Design-Important Concepts Relating to Research Design-Different Research Designs-Basic Principles of Experimental Designs.			
Unit – III	**DATA COLLECTION**	Periods	**9**
Data Collection: Collection of Primary Data-Observation Method-Interview Method-Collection of Data through Questionnaires-Collection of Data through Schedules-Difference between Questionnaires and Schedules-Collection of Secondary Data- Processing Operations-Elements/Types of Analysis-Statistics in Research.			
Unit – IV	**DATA ANALYSIS AND INTERPRETATION**	Periods	**9**
Data analysis - Statistical techniques and choosing an appropriate statistical technique - Hypothesis, Hypothesis testing - Data processing software (e.g. SPSS etc.) - statistical inference - Interpretation of results.			
Unit - V	**REPORT WRITING**	Periods	**9**
Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles, Research Journals, Indexing and citation of Journals, Intellectual property, Plagiarism.			
		Total Periods	**45**

References	
1.	C. R. Kothari, "Research Methodology – Methods and Techniques", 2nd Edition, New Age International Publishers
2.	Bordens, K. S. and Abbott, B. B., "Research Design and Methods – A Process Approach", 8th Edition, McGraw-Hill, 2011
3.	Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
4.	Davis, M., Davis K., and Dunagan M., "Scientific Papers and Presentations", 3rd Edition, Elsevier Inc.
E-Resources	
1.	https://www.oreilly.com/library/view/research-methodology/9789353067090/
2.	https://bbamantra.com/research-methodology/

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205

Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**		Semester		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC002	**Pedagogy Studies**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- Understand the concept of programme design through evidences.
- Illustrate the practice of innovative teaching methodology.
- Analyze the method of teacher education.
- Enhance the infrastructure in the class room.
- Elaborate the directions of future research

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Describe about the concept of programme design through evidences	K2
	CO2: Demonstrate the practice of innovative teaching methodology	K2
	CO3: Evaluate the method of teacher education	K4
	CO4: Examine the infrastructure in the class room	K3
	CO5: Define the directions of future research	K3

Pre-requisites

CO / PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Cos	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	3	3	2									2			
CO 2	3	3	3	2									2	2		
CO 3	3	3	3	2						2	2		1			
CO 4	3	3	2	2						2	2		1			
CO 5	3	3	2	2									1			

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus

Unit - I	INTRODUCTION	Periods	9

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

Unit – II	THEMATIC OVERVIEW	Periods	9

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit – III	PEDAGOGICAL PRACTICES	Periods	9

Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit – IV	PROFESSIONAL DEVELOPMENT	Periods	9

Professional development: alignment with classroom practices and follow-up support -Peer support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes.

Unit - V	RESEARCH GAPS AND FUTURE DIRECTIONS	Periods	9

Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Total Periods	**45**

References

1.	Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2.	Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3.	Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

E-Resources

1.	https://nptel.ac.in/courses/121/105/121105010/ CO-ORDINATED BY : IIT KHARAGPUR
2.	https://nptel.ac.in/courses/109/105/109105122/ CO-ORDINATED BY : IIT KHARAGPUR

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Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**		Semester		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC003	**Disaster Management**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work.
- Categorize the Risk Assessment in national level and global level.

Course Outcome

At the end of the course, the student should be able to	Knowledge Level
CO1: Understand the effects of disaster	K2
CO2: Analyze differences between disasters and hazards	K2
CO3: Disaster management techniques	K3
CO4: Risk management techniques	K3
CO5: Elaborate the Risk assessment in world level	K4

Pre-requisites --

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Cos	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1					2	2	2				2	1	1			
CO 2					2	2	2				2	1	1			
CO 3					2	2	2				2	1	2			
CO 4					2	2	2				2	1	2			1
CO 5					2	2	2				2	1	2			1

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus

Unit - I	**INTRODUCTION**	Periods	**9**

Introduction Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Unit – II	**REPERCUSSIONS OF DISASTERS AND HAZARDS**	Periods	**9**

Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

Unit – III	**DISASTER PRONE AREAS IN INDIA**	Periods	**9**

Disaster Prone Areas in India Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

Unit – IV	**DISASTER PREPAREDNESS AND MANAGEMENT PREPAREDNESS**	Periods	**9**

Disaster Preparedness and Management Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

Unit – V	**RISK ASSESSMENT**	Periods	**9**

Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival. Disaster Mitigation Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Total Periods	**45**

References

1.	R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2.	Sahni, Pardeepet.al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3.	Goel S. L., Disaster Administration and Management Text And Case Studies",Deep&Deep Publication Pvt. Ltd., New Delhi.

E-Resources

1.	https://www.digimat.in/nptel/courses/video/124107010/L36.html
2.	https://media.ifrc.org/ifrc/what-we-do/disaster-and-crisis-management/disaster-preparedness/

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205

Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**		Semester		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC004	**Value Education**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- To introduce the value of education and self- development.
- To interpret good values in students.
- To elaborate the importance of character.
- To distinguish the relationship and their cooperation.
- To interpret the religions and equality.

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Understand education values	K2
	CO2: Analyze importance of cultivation values	K2
	CO3: Importance of personality development	K3
	CO4: Character maintenance	K3
	CO5: Examine the religions and honesty.	K4

Pre-requisites -

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Cos	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	3	3	2									2			
CO 2	3	3	3	2									2			
CO 3	3	3	3	2									2			
CO 4	3	3	3	2									2			
CO 5	3	3	3	2									2			

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**INTRODUCTION**	Periods	**9**
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation, Standards and principles, Value judgments.			
Unit – II	**IMPORTANCE OF CULTIVATION OF VALUES**	Periods	**9**
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.			
Unit – III	**PERSONALITY AND BEHAVIOR DEVELOPMENT**	Periods	**9**
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour.			
Unit – IV	**RELATIONSHIP MANAGEMENT**	Periods	**9**
Universal brotherhood and religious tolerance True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.			
Unit - V	**CHARACTER AND COMPETENCE**	Periods	**9**
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.			
		Total Periods	**45**
References			
1.	Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi 2011.		
E-Resources			
1.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5132380/		
2.	https://www.examrace.com/Study-Material/Education/Value-Education-YouTube-Lecture-Handouts.html		

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Programme	**M.E.**	Programme Code		**202**	Regulation		**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester				
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC005	**Constitution of India**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To identify the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To illustrate the role of socialism in India after the commencement of the Bolshevik Revolution and its impact on the initial drafting of the Indian Constitution.
- To categorize the governance bodies in the organization.
- To interpret the various administration in states.

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1:Define the history of Indian Constitution	K2
	CO2:Categorize the importance of constitutional rights and duties.	K3
	CO3:Understand the functions of Local administration	K2
	CO4:Demonstrate the governance bodies in the organization.	K4
	CO5:Prioritize the local and district administration in states.	K4
Pre-requisites	--	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

os	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**
O 1	3	3	2	2									1			
O 2	3	3	2	2									1			
O 3	3	3	2	2									1			
O 4	3	3	2	2									1			
O 5	3	3	2	2									1			

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**INTRODUCTION**	Periods	**9**
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)			
Unit – II	**PHILOSOPHY OF THE INDIAN CONSTITUTION**	Periods	**9**
Philosophy of the Indian Constitution: Preamble, Salient Features			
Unit – III	**CONTOURS OF CONSTITUTIONAL RIGHTS& DUTIES**	Periods	**9**
Contours of Constitutional Rights& Duties: Fundamental Rights- Right to Equality- Right to Freedom Right against Exploitation- Right to Freedom of Religion ,Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties			
Unit – IV	**ORGANS OF GOVERNANCE**	Periods	**9**
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.			
Unit - V	**LOCAL ADMINISTRATION**	Periods	**9**
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments) Village level: Role of Elected and Appointed officials, Importance of grass root democracy			
		Total Periods	**45**

References	
1.	The Constitution of India, 1950 (Bare Act), Government Publication.
2.	Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3.	M. P. Jain, Indian Constitution Law, 7th Edition., Lexis Nexis, 2014.

E-Resources	
1.	https://nptel.ac.in/courses/129/106/129106002/ CO-ORDINATED BY : IIT MADRAS
2.	https://niti.gov.in/niti-lecture

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Programme	**M.E.**	Programme Code		**202**	Regulation		**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**			Semester				
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC006	**English for Research Paper Writing**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- Illustrate the improve your writing skills and level of readability
- Categorize to write in each section.
- Understand the skills needed when writing a Title
- Ensure the good quality of paper at very first-time submission.
- Elaborate the concept of writing skills for submission of paper.

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Understand forming and brake up sentences.	K2
	CO2: Importance of finding plagiarism.	K4
	CO3: Summarize the concept of literature reviews.	K2
	CO4: Extend the focus on skill development activities.	K2
	CO5: Develop the writing skills in the paper.	K3

Pre-requisites --

CO / PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Cos	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	3	3	2									1			2
CO 2	3	3	3	2									1			2
CO 3	3	3	3	2									1			1
CO 4	3	3	3	2									1			1
CO 5	3	3	2	2									1			1

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**PLANNING AND PREPARATION**	Periods	**9**
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.			
Unit – II	**CLARIFICATIONS**	Periods	**9**
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.			
Unit – III	**LITERATURE REVIEW**	Periods	**9**
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.			
Unit – IV	**SKILL DEVELOPMENT - I**	Periods	**9**
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.			
Unit - V	**SKILL DEVELOPMENT - II**	Periods	**9**
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission			
		Total Periods	**45**

References	
1.	Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2.	Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3.	Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

E-Resources	
1.	https://nptel.ac.in/courses/110/105/110105091/ CO-ORDINATED BY : IIT KHARAGPUR
2.	https://www.udemy.com/topic/research-paper-writing

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Programme	**M.E.**	Programme Code			**202**	Regulation		**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC007	**Personality Development through Life Enlightenment Skills**	2	0	0	0	100	-	100

Course Objective	The main objective of the course is • Learn to achieve the highest goal happily. • Identify a person with stable mind, pleasing personality and determination. • Determine wisdom in students. • Interpret managing others effectively. • Extend the increasing productivity.	
Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Identify goals	K2
	CO2: Analyze Personality development	K2
	CO3: Make use of appropriate life and career goals	K3
	CO4: Developing relationships with others	K3
	CO5: Understand the value of diversity	K2
Pre-requisites	--	

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Programme Outcomes (POs)												PSOs			
PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
3	3	3	2					2				1			
3	3	3	2					2				1			
3	3	3	2					2	2			2			
3	3	3	2						2			2			
3	3	3	2									1			

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

Content of the syllabus

Unit - I	**NEETISATAKAM – I**	Periods	**9**

Neetisatakam-Holistic development of personality
Verses- 19,20,21,22 (wisdom)
Verses- 29,31,32 (pride & heroism)

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Verses- 26,28,63,65 (virtue)			
Unit – II	**NEETISATAKAM – II**	Periods	**9**
Neetisatakam-Holistic development of personality Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)			
Unit – III	**APPROACH TO DAY TO DAY WORK AND DUTIES**	Periods	**9**
Approach to day to day work and duties. ShrimadBhagwadGeeta : Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.			
Unit – IV	**STATEMENTS OF BASIC KNOWLEDGE**	Periods	**9**
Statements of basic knowledge. ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18			
Unit - V	**PERSONALITY OF ROLE MODEL**	Periods	**9**
Personality of Role model. ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63			
		Total Periods	**45**

References	
1.	"Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2.	Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,
3.	Rashtriya Sanskrit Sansthanam, New Delhi.

E-Resources	
1.	https://library.um.edu.mo/ebooks/b17771201.pdf
2.	https://www.staticcontents.youth4work.com/university/Documents/Colleges/CollegeSummaryAttach/29f57018-6412-4dee-b24b-ac29e54a0f9e.pdf

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Programme	**M.E.**	Programme Code			**202**	Regulation		**2023**	
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**				Semester				
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
P23AC008	**UNIVERSAL HUMAN VALUES**	2	0	0	0	100	-	100	

Course Objective	The student should be made to, • To assist students in understanding the differences between values and skills, and in understanding the need, basic guidelines, content and the process of value education. • To help students initiate a process of dialog within themselves to understand what they 'really want to be' in their lives and professions • To help students understand the meaning of happiness and prosperity for human beings. • To help students understand harmony at all the levels of human living and to lead an ethical life	
Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Evaluate the significance of value inputs in formal education and start applying them in their life and profession	K4
	CO2: Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	K2
	CO3: Analyze the value of harmonious relationship based on trust and respect in their life and profession	K2
	CO4: Examine the role of a human being in ensuring harmony in society and nature.	K3
	CO5: Understand the harmony at all the levels of human living and to lead an ethical life	K3
Pre-requisites	--	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**			
CO s	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PSO 2**	**PS O 3**	**PSO 4**
O 1	1	1		3	3	1	2	3	3	2	3	1	1			
O 2	2	1	2	3	2	2	2	2	1	1	3	1	1			
O 3	3	1	2	3	3	1	3	2	2	1	2	3	1			
CO4	1	2	3	1	3	2	2	2	3	1	2	1	1			
CO5	2	1	2	1	2	1	3	3	2	2	1		1			

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**Introduction-Basic Human Aspiration**	Periods	**9**
The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.			
Unit – II	**Right Understanding (Knowing)**	Periods	**9**
The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).			
Unit – III	**Understanding Human Being**	Periods	**9**
Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self			
Unit – IV	**Understanding Nature and Existence**	Periods	**9**
A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the self.			
Unit - V	**Understanding Human Conduct**	Periods	**9**
Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with Allen compassing Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence			
		Total Periods	**45**

Text Books	
1.	R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
2.	Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.
References E-Resources	
1.	Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2.	E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain
E-Resources	
1.	https://nptel.ac.in/courses/109104068
2.	https://fdp-si.aicte-india.org/UHV-I

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205

Programme	**M.E.**	Programme Code	**202**	Regulation	**2023**
Department	**POWER SYSTEMS ENGINEERING / ELECTRICAL AND ELECTRONICS ENGINEERING**		Semester		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC009	**Online Course**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- Illustrate about various online certification courses.
- Understand the importance of online certification courses.
- Distinguish about job opportunities.
- Make use of this course can prepare the competitive examination.
- Classify the online tools for course.

Course Outcome

At the end of the course, the student should be able to	Knowledge Level
CO1: Evaluate the programming skills.	K3
CO2: Identify online certifications.	K2
CO3: Appraise the value of the courses and job opportunities	K5
CO4: Categorize in Quantitative Reasoning and Technological Literacy.	K4
CO5: Develop the ICT tools for the specific course.	K4

Pre-requisites --

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Cos	Programme Outcomes (POs)												PSOs			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	3	3	2	2						2			2			2
CO 2	3	3	2	2						2			2			2
CO 3	3	3	2	2						2	2		2			2
CO 4	3	3	2	2						2	2		2	2	3	2
CO 5	3	3	2	2							2		2	3	2	2

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Course Assessment Methods

Direct
1. Online Assignments and Assessments
Indirect
1. Course - end survey

LIST OF COURSES

OnlineCourses such as :

1. NPTEL Courses
2. SWAYAM Courses
3. IIT-B Spoken Tutorials
4. UDEMY Courses
5. CCNA Courses
6. MOOC Courses
7. Microsoft Virtual Academy Certification courses etc.,

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