M. Tech. (Electrical Engineering)
Specialization: Power Electronics and Power System

Program Educational Objectives (PEOs):

I. To produce electrical power systems postgraduates, who are employable in public and private industries /institutes /organizations or pursue higher education.
II. To prepare postgraduates who have the ability to identify and address current and future problems in the domain of power systems, power electronics and electrical machines.
III. To inculcate research attitude and lifelong learning among postgraduates.

Program Outcomes (POs):

a. Acquire in-depth knowledge in the domain of power systems.
b. Ability to critically analyze various power system components, models and their operation.
c. Ability to apply fundamentals and concepts to analyze, formulate and solve complex problems of electrical power systems and its components.
d. Apply advanced concepts of electrical power engineering to analyze, design and develop electrical components, apparatus and systems to put forward scientific findings at national and international levels.
e. Ability to use advanced techniques, skills and modern scientific and engineering tools for professional practice.
f. Preparedness to lead a multidisciplinary scientific research team and communicate effectively.
g. Demonstrate and apply knowledge and understanding of engineering principles for project management.
h. To motivate exploring ideas and to encourage for independent, reflective and lifelong learning.
i. To understand the impact of engineering solutions in a global, economic, environmental and societal context.

Program Educational Objectives and Program Outcomes Mapping:

Following table shows the correlation between PEOs and POs.

PO→	a	b	c	d	e	f	g	h	i
PEO↓									
I	√	√	√	√	√	√	√	√	√
II	√	√	√	√	√		√		
III				√	√	√		√	√

Note: The cells filled in with ✓ indicate the fulfilment/correlation of the concerned PEO with the PO.

M. Tech. (Electrical Engineering)
Specialization: Power Electronics and Power System

Correlation between the POs and the COs

SEMESTER- I

Sr. No.	Course Code	Name of the course	Course Outcomes	Contribution to POs								
				a	b	c	d	e	f	g	h	i
Semester - I												
1	PSMC	Optimization Techniques	A. Explain and use the basic theoretical principles of optimization and various optimization techniques. B. Develop and select appropriate models corresponding to problem descriptions in engineering and solve them using appropriate techniques C. Analyze and solve complex optimization problems in power system and machines D. Design optimization models and use them in solving problems in power system planning and operation E. To develop and Implement optimization algorithms and use software tools to solve problems in engineering F. Make sound recommendations based on these solutions, analysis and limitations of these models.	✓	✓	✓		✓				
2	PCC	Power System Analysis	A. Comprehend basic concepts and principles in power system analysis. B. Formulate and solve power flow problems, economic and environmental dispatch problems. C. Demonstrate understanding in the theory of power system security analysis, voltage stability analysis, optimal power flow and state	✓	✓	✓	✓			✓		✓

			estimation. D. Develop algorithms as well as to use software tools to solve power system analysis and stability problems. E. To make sound recommendations and implement as required based on these solutions, analyse practical power system problems								
3	PCC	Analysis of Electric Machines	A. Analyze electromechanical devices and machines B. Use reference frame theory to study and analyze the behaviour of induction and synchronous machines C. Calculate the machine inductances for use in machine analysis D. Model the electrical machine from the terminal junction with transmission systems	✓	✓	✓	✓			✓		✓
4	PCC	Advanced Power Electronics	A. Have good understanding of characteristics of PSDs such as SCRs, GTOs, IGBTs and Use them in practical systems. B. Have knowledge of working of multi level VSIs, DC-DC switched mode converters, Cycloconverters and PWM techniques and the ability to use them properly C. Acquire knowledge of power conditioners and their applications. D. Have the ability to design power circuit and protection circuit of PSDs and converters	✓	✓	✓	✓			✓		✓
5	LC	Simulation Laboratory	A. Model electrical power system under steady state and transient conditions. B. Use MATLAB and ATP/PSCAD for power system studies. C. Determine the reactive power requirement of lines and compute VAR compensation required from voltage profile along the line. D. Compute the Y-bus matrix, perform load flow studies and interpret the results.	✓	✓	✓	✓					

			E. Use Maxwell software for analysis of electric machines. F. Use PSIM, PSPICE for power electronic circuit simulation. G. Use DigSILENT, ETAP for power system analysis.									
6	MLC	Research Methodology	A. Understand research problem formulation. B. Analyze research related information. C. Follow research ethics.						✓	✓	✓	✓
7	MLC	Humanities	A. Understand the need, basic guidelines, content and process for value education. B. Understand the harmony in the family, difference between respect and differentiation C. Understand the harmony in nature, interconnectedness and mutual fulfillment in nature, holistic perception of harmony. D. Understand natural acceptance of human values, competence in professional ethics.						✓		✓	✓

M. Tech. (Electrical Engineering)
Specialization: Power Electronics and Power System

Correlation between the POs and the COs

SEMESTER- II

Semester II											
8	PCC	Power System Dynamics and Stability	A. Comprehend concepts in the dynamic phenomena and stability of power systems B. Demonstrate understanding the theory and practice of modeling power system components, such as synchronous machines, excitation systems and governors, power system stabilizers C. Analyze dynamic and oscillatory behavior of power systems and to alleviate the same. D. Interpret results of system stability studies.	✓	✓	✓	✓			✓		✓
9	PCC	Power Electronics Application to Power Systems	A. Classify and explain the functioning of FACTS devices. B. Model FACTS devices to control the power flow and optimize transmission capacity. C. Identify the need for HVDC systems. D. Identify converters for HVDC application and discuss their control characteristics. E. Compare the HVAC and HVDC systems.	✓	✓	✓	✓			✓		✓
10	PCC	Digital Protection	A. Select and model various components (like CT, CVT, and numerical relay) for protection purpose. B. Use and implement least squares, DFT, FFT phasor estimation algorithms for numerical protection. C. Design and simulate over current, distance and differential protection schemes for power systems. D. Develop the advanced schemes for power system protection using new technologies such as synchronized measurements, PMUs, GPS, fiber optics.	✓	✓	✓	✓			✓		✓

	Department Elective I										
11	DEC	Power Systems Transients	A. Define, classify, interpret and model the transient phenomenon in power system B. Simulate the transients using EMTP/ATP software. C. Analyze transient phenomenon and develop the strategies for mitigate associated problems. D. Evaluate the transient process due to lightning.	✓	✓	✓	✓			✓		✓
12	DEC	Renewable Energy Systems	A. Appreciate the importance of energy crises and consequent growth of the power generation from the renewable energy sources and participate in solving these problems. B. Demonstrate the knowledge of the physics of wind power and solar power generation and all associated issues so as to solve practical problems. C. Demonstrate the knowledge of physics of solar power generation and the associated issues. D. Identify, formulate and solve the problems of energy crises using wind and solar energy. E. Identify the possible research avenues in the field of wind and solar	✓	✓	✓	✓			✓		✓
13	DEC	Electrical Power Distribution Systems	A. Plan the distribution system for given application. B. Design primary and secondary distribution systems C. Address the protection and reliability issues in distribution systems D. Analyze and model unbalanced distribution systems in presence of DGs E. Design active network management	✓	✓	✓	✓			✓		✓
14	DEC	Restructured Power System	A. Describe various types of regulations in power systems. B. Identify the need of deregulation. C. Define and describe the technical and non-technical issues in	✓	✓	✓	✓			✓		✓

			deregulated Power Industry. D. Identify and give examples of existing electricity markets. E. Classify different market mechanisms and to summarize the role of various entities in the market. F. Define and describe various pricing mechanisms in the Generation, Transmission and Distribution sectors.									
15	DEC	Any other course with approval of DPPC										
	Department Elective II											
16	DEC	Smart Grid Technologies	A. Differentiate conventional and smart grid B. Identify the need of smart grid, micro grid, smart metering, smart storage, hybrid vehicles, home automation, smart communication C. Express the need and specify the components of smart grid and smart communication.	✓	✓	✓	✓			✓		✓
17	DEC	Energy Storage System	A. Understand the emerging needs of Electrical Energy Storage Systems. B. Analyze the performance of various Electrical Energy Storage Systems. C. Assess the markets for the Electrical Energy Storage Systems.			✓	✓	✓	✓	✓		✓
18	DEC	Power Quality and Reliability	A. Understand various power line disturbances and how the quality of the power gets deteriorated. B. Identify the sources of each type of power line disturbance C. Find out the remedies for each type of disturbance. D. Identify and use various equipment for measurement of these disturbances	✓	✓	✓	✓			✓		✓
19	DEC	High Voltage	A. Propose the proper insulating medium / system; based on the	✓	✓	✓	✓			✓		✓

		Engineering and Switchgear	insulation strength of the material for applying to high voltage systems. B. Measure the high voltages and currents. C. Design the high voltage laboratory and the equipment installations in it. D. Carry out HV tests on various equipments e. g. Cables, CBs, Insulators etc, using relevant testing IS and be able to give analysis of the test results.									
20	DEC	Embedded System Design	A. Illustrates memory organization B. Test and debug peripherals in embedded system C. Understand RTOS D. Design small embedded system			✓	✓	✓	✓	✓		✓
21	DEC	Any other course with approval of DPPC										
22	PS-508	Hardware Laboratory	A. Select a suitable microcontroller for a targeted task. B. Code for the selected microcontroller. C. Install and maintain the compilation and debug tools. **D.** Solve a given task efficiently.	✓	✓	✓						
23	MLC	Intellectual Property rights	A. Be vigilant and enlightened to generate new ideas. B. Appreciate the importance of IP in the institution of an efficiently organized society. C. Understand that how IPR are sources of national wealth and mark of an economic leadership in the context of global market scenario.								✓	✓
24	LLC	Liberal Learning course	A. Demonstrate the additional information related to the area of their interest may not be even non technical with enthusiasm B. Demonstrate the hidden talent in the area of their interest						✓		✓	✓

M. Tech. (Electrical Engineering)
Specialization: Power Electronics and Power System

Correlation between the POs and the COs

SEMESTER- III and IV

Semester III											
25	Dissertation	Project Stage I	A. Implement innovative ideas in the field of power systems. B. Prepare good technical project reports for publication in journals and conferences. C. Enhance presentation skills. D. Take up any challenging job in industry.					✓	✓	✓	✓	✓
26	SLC	Project and Finance Management	A. Demonstrate project management skills B. Analyze risk and manage it. C. Illustrate project financial evaluation						✓	✓	✓	✓
Semester IV											
27	Dissertation	Project Stage II	A. Implement innovative ideas in the field of power systems. B. Prepare good technical project reports for publication in journals and conferences. C. Enhance presentation skills. D. Take up any challenging job in industry.					✓	✓	✓	✓	✓

M. Tech. (Electrical) Curriculum Structure

Specialization: Power Electronics and Power Systems

(w. e. f. 2016-17)

List of Abbreviations

ILE- Institute level Open Elective Course
PSMC – Program Specific Mathematics Course
PCC- Program Core Course
DEC- Department Elective Course
LLC- Liberal Learning (Self learning) Course
MLC- Mandatory Learning Course (Non-credit course)
SLC- Special Learning course
LC- Laboratory Course

Semester I

Sr. No.	Course Type/Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	ILE/OLE	Open Elective/Science Elective Course	3	0	0	3
2.	PSMC	Engineering Optimization	3	0	0	3
3.	PCC	Power System Analysis	3	0	0	3
4.	PCC	Analysis of Electric Machines	3	1	0	4
5.	PCC	Advanced Power Electronics	3	1	0	4
6.	LC	Simulation Laboratory	0	0	6	3
7.	MLC	Research Methodology	1	0	0	0
8.	MLC	Humanities	1	0	0	0
		Total	**17**	**2**	6	**20**

Semester II

Sr. No.	Course Code/Type	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	PCC	Power Systems Dynamics and Stability	3	0	0	3
2.	PCC	Power Electronics Applications to Power Systems	3	1	0	4
3.	PCC	Digital Protection	3	0	0	3
4.	DEC	**Elective – I** a. Power Systems Transients b. Renewable Energy Systems c. Electrical Power Distribution Systems d. Restructured Power Systems e. Any other course with the approval of DPPC	3	0	0	3
5.	DEC	**Elective – II** a. Smart Grid Technologies b. Energy Storage Systems c. Power Quality and Reliability d. HV Engineering and Switchgear e. Embedded Systems f. Any other course with the approval of DPPC	3	0	0	3
6.	LC	Hardware Laboratory	0	0	6	3
7.	MLC	Intellectual Property Rights	1	0	0	0
8.	LLC	Liberal Learning Course	1	0	0	1
		Total	**17**	**1**	**6**	**20**

Semester-III

Sr. No.	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	Dissertation	Dissertation Phase – I	--	--	--	13
2	SLC	Project and Finance Management	0	0	0	03
		Total	**--**	**--**	**--**	**16**

Semester-IV

Sr. No.	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	Dissertation	Dissertation Phase - II	--	--	--	18
		Total	**--**	**--**	**--**	**18**

Total Credits=74

Semester – Wise Academic Engagement and Credits

Semester	Academic Engagement (In Hours)	Credits
I	25	20
II	24	20
III	--	16
IV	--	18
	Total Credits	74

Semester I

ILE/OEC IS: Institute Level Elective/Open Elective Course

Students may opt any of the elective courses offered by institute as an open elective.

OEC: Engineering Optimization

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each
End-Sem Exam – 60

Course Outcomes:

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

A. Explain and use the basic theoretical principles of optimization and various optimization techniques.
B. Develop and select appropriate models corresponding to problem descriptions in engineering and solve them using appropriate techniques
C. Analyze and solve complex optimization problems in engineering
D. Design optimization models and use them in solving real life problems
E. To develop and Implement optimization algorithms and use software tools to solve problems in engineering
F. Make sound recommendations based on these solutions, analysis and limitations of these models.

Syllabus Contents:

Introduction to optimization, classical optimization: single variable, multivariable optimization techniques, linear programming: simplex method, duality, transportation problems, non-linear programming: one dimensional minimization methods, unconstrained optimization, dynamic programming: development of dynamic programming, principle of optimality, practical aspects of optimization: reduced basic techniques, sensitivity of optimum solution to problem parameters, modern optimization techniques

References:

1. R. Fletcher, “Practical Optimization”, Second edition, John Wiley and Sons, New York, 1987.
2. S. S. Rao, “Engineering Optimization-Theory and practice”, Fourth edition, Wiley Easter Publications, January 2009.
3. K. V. Mital and C. Mohan, “Optimization Methods in Operations Research and System

Analysis", New age International Publishers, Third edition, 1996.
4. Gillette, "Computer Oriented Operation Research", Mc-Graw Hill Publications.
5. Bazaraa M. S., Sherali H.D. and Shetty C. "Nonlinear Programming Theory and Algorithms", John Wiley and Sons, New York 1993.
6. Bertsekas D. P., "Constrained Optimization and Lagrange Multiplier Methods", Academic Press, New York, 1982.

PSMC: Optimization Techniques

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each
End-Sem Exam – 60

Course Outcomes:

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

A. Explain and use the basic theoretical principles of optimization and various optimization techniques.
B. Develop and select appropriate models corresponding to problem descriptions in engineering and solve them using appropriate techniques
C. Analyze and solve complex optimization problems in power system and machines
D. Design optimization models and use them in solving problems in power system planning and operation
E. To develop and Implement optimization algorithms and use software tools to solve problems in engineering
F. Make sound recommendations based on these solutions, analysis and limitations of these models.

Syllabus Contents:

Introduction to optimization, classical optimization: single variable, multivariable optimization techniques, linear programming: simplex method, duality, transportation problems, non-linear programming: one dimensional minimization methods, unconstrained optimization, dynamic programming: development of dynamic programming, principle of optimality, practical aspects of optimization: reduced basic techniques, sensitivity of optimum solution to problem parameters, modern optimization techniques, solving problems related to power system operation and control

References:

1. R. Fletcher, "Practical Optimization", Second edition, John Wiley and Sons, New York, 1987.

2. S. S. Rao, “Engineering Optimization-Theory and practice”, Fourth edition, Wiley Easter Publications, January 2009.
3. K. V. Mital and C. Mohan, “Optimization Methods in Operations Research and System Analysis”, New age International Publishers, Third edition, 1996.
4. Gillette, “Computer Oriented Operation Research”, Mc-Graw Hill Publications.
5. Bazaraa M. S., Sherali H.D. and Shetty C. “Nonlinear Programming Theory and Algorithms”, John Wiley and Sons, New York 1993.
6. Bertsekas D. P., “Constrained Optimization and Lagrange Multiplier Methods”, Academic Press, New York, 1982.
7. D. P. Kothari an d J. S. Dhillon, “ Power System optimization”, PHI Learning Pvt. Ltd., 2004

PCC- : Power System Analysis

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each
End-Sem Exam – 60

Course Outcomes:

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

A. Comprehend basic concepts and principles in power system analysis.
B. Formulate and solve power flow problems, economic and environmental dispatch problems.
C. Demonstrate understanding in the theory of power system security analysis, voltage stability analysis, optimal power flow and state estimation.
D. Develop algorithms as well as to use software tools to solve power system analysis and stability problems.
E. To make sound recommendations and implement as required based on these solutions, analyse practical power system problems.

Syllabus Contents:

Algorithms for formation of bus admittance and impedance matrices, power flow solutions: Gauss Seidal, Newton-Raphson, Fast decoupled load flow, optimal power flow, sparsity exploitation in power system studies, Z - matrix for short circuit studies, concept security state and security analysis, contingency studies, unit commitment, state estimation, Weighted least squares state estimation, optimal hydro-thermal scheduling, voltage stability, Artificial Intelligence applications to power system analysis.

References:

1. G. W. Stagg and A. H. El-Abiad, "Computer Methods in Power System Analysis",
2. McGraw Hill 1968.
3. G. L. Kusic, "Computer Aided Power Systems Analysis", Prentice Hall, 1986.
4. I. J. Nagrath and D. P. Kothari, " Modern Power Systems Analysis", Tata McGraw Hill, 1980.
5. A J. Wood and B. F. Wollenberg, "Power Generation, Operation and Control", John Wiley, 1984.

PCC- : Analysis of Electric Machines

Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/week	T1, T2 – 20 marks each
Tutorial : 1 hr/week	End-Sem Exam – 60

Course Outcomes:

At the end of this course students will be able to,

A. Analyze electromechanical devices and machines
B. Use reference frame theory to study and analyze the behaviour of induction and synchronous machines
C. Calculate the machine inductances for use in machine analysis
D. Model the electrical machine from the terminal junction with transmission systems

Syllabus Contents:

Principle of unified machine theory, generalized torque equation, performance evaluation of DC machine and speed control, three phase induction motor-transformation methods, stationary, rotor and synchronous frames and corresponding equivalent circuits, three phase synchronous motor: representation, Park transformation, drives, various control techniques, concept of space vector, field oriented control and direct torque control of IM, permanent magnet synchronous motors- machine model (d-q) and control methods, reluctance machines models.

References:

1. P. C. Krause, "Analysis of Electric Machinery", McGraw Hill, New York, 1987.
2. Chee Mun Ong, "Dynamic simulation of Electrical Machinery using Matlab/Simulink" Prentice Hall PTR, 1997
3. P. Vas, "Vector Control of A.C. Machines", Clarendon Press, Oxford 1990.
4. J .M. D. Murphy and F.G. Turnbull, "Power Electronic Control of AC motors", Pergamum Press, 1988.
5. W. Leonhard, "Control of Electrical Drives", Springer Verlag, 1985.

PCC- : Advanced Power Electronics

Teaching Scheme
Lectures: 3 hrs/week
Tutorial : 1 hr/week

Examination Scheme
T1, T2 – 20 marks each
End-Sem Exam – 60

Course Outcomes:

At the end of the course the student will,

A. Have good understanding of characteristics of PSDs such as SCRs, GTOs, IGBTs and Use them in practical systems.
B. Have knowledge of working of multi level VSIs, DC-DC switched mode converters, Cycloconverters and PWM techniques and the ability to use them properly
C. Acquire knowledge of power conditioners and their applications.
D. Have the ability to design power circuit and protection circuit of PSDs and converters

Syllabus Contents:

Power electronic systems - An overview of PSDs, multi pulse diode rectifier, multi pulse SCR rectifier, phase shifting transformers, multilevel voltage source inverters: two level voltage source inverter, cascaded H bridge multilevel inverter, diode clamped multilevel inverters, flying capacitor multilevel inverter, PWM current source inverters, DC to dc switch mode converters, AC voltage controllers : Cyclo-converters, matrix converter, Power conditioners and UPS, design aspects of converters, protection of devices and circuits.

References:

1. N. Mohan, T. M. Undeland and W. P. Robbins, “Power Electronics: Converter, Applications and Design”, John Wiley and Sons, 1989.
2. M.H. Rashid, “Power Electronics”, Prentice Hall of India, 1994.
3. B. K .Bose, “Power Electronics and A.C. Drives”, Prentice Hall, 1986.
4. Bin Wu, “High power converters and drives”, IEEE press, Wiley Enter science.

LC: Simulation Laboratory

Teaching Scheme
Lectures: 6 hrs/week

Examination Scheme
Continuous Assessment- 50 Marks
Final Practical/Oral Exam – 50 Marks

Course Outcomes:

At the end of this course, the students will be able to

A. Model electrical power system under steady state and transient conditions.
B. Use MATLAB and ATP/PSCAD for power system studies.
C. Determine the reactive power requirement of lines and compute VAR compensation required from voltage profile along the line.
D. Compute the Y-bus matrix, perform load flow studies and interpret the results.
E. Use Maxwell software for analysis of electric machines.
F. Use PSIM, PSPICE for power electronic circuit simulation.
G. Use DigSILENT, ETAP for power system analysis.

Syllabus Contents: This lab will cover simulation experiments/assignments on the platform like MATLAB, ATP/EMTP, PSCAD, MAXWELL, LABVIEW, PSIM, PSPICE, DigSILENT, etc. The problems will be related to the core subjects and electives.

References:

1. Help files of relevant software

MLC: Research Methodology

Teaching Scheme
Lectures: 1 hr/week

Examination Scheme
End-Sem Exam - 50

Course Outcomes:

At the end of this course, the students will demonstrate the ability to;

A. Understand research problem formulation.
B. Analyze research related information.
C. Follow research ethics.

Syllabus Contents:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations. Effective literature studies approaches, analysis, Plagiarism , Research ethics, Effective technical writing, how to write report, Paper

Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

References:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. by Ranjit Kumar, 2 nd Edition , “Research Methodology: A Step by Step Guide for beginners” .

MLC: Humanities

Teaching Scheme
Lectures: 1 hr/week

Examination Scheme
Mid Sem – 20 marks
Quiz/Assignment-50
End-Sem Exam - 30

Course Outcomes:

At the end of this course, the students will demonstrate the ability to;

A. Understand the need, basic guidelines, content and process for value education.
B. Understand the harmony in the family, difference between respect and differentiation
C. Understand the harmony in nature, interconnectedness and mutual fulfillment in nature, holistic perception of harmony.
D. Understand natural acceptance of human values, competence in professional ethics.

Syllabus Contents:

Unit 1 Communication skills
Introduction to the scope and significance of learning Humanities. And communication. Comprehension, Written communication: Formal letters, CV, Reports, Paragraphs, Grammar and Vocabulary building exercises, Grammar and Vocabulary building exercises
Unit 2 : Social Science and Development
Indian and western concept, Process of social change in modern India, Impact of development of Science and technology on culture and civilization, Urban sociology and Industrial sociology
Social problems in India: overpopulated cities, no skilled farmers, unemployment, addictions and abuses, illiteracy, too much cash flow, stressful working schedules, nuclear families etc.
Unit 3 : Technology assessment and transfer
Sociological problems of economic development and social change
Assessment and transfer of technology, problems related with tech transfer with reference to India, Roles of an engineer in value formation and their effects on society

References:

1. English for everyone – Mcmillan (India) Ltd.
2. Jude paramjit S and Sharma Satish K, "Ed: dimensions of social change"
3. Raman Sharma, "Social Changes in India".

Semester II

PCC: Power System Dynamics and Stability

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each
End-Sem Exam - 60

Course outcomes:

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

A. Comprehend concepts in the dynamic phenomena and stability of power systems
B. Demonstrate understanding and the ability to model main power system components, such as synchronous machines, excitation systems and governors, power system stabilizer
C. Analyze dynamic and oscillatory behavior of power systems and to alleviate the same.
D. Interpret results of system stability studies.

Syllabus Contents:

Basic concepts of dynamical systems and stability, modelling of power system components for stability studies: generators, transmission lines, excitation and prime mover controllers, analysis of single machine and multi-machine systems, small signal angle instability (low frequency oscillations): damping and synchronizing torque analysis, Eigen value analysis, mitigation using power system stabilizers, PSS design for multi-machine systems, small signal angle instability (sub-synchronous frequency oscillations): analysis and counter-measures, transient instability: analysis using digital simulation and energy function method, transient stability controllers.

References:

1. K. R. Padiyar, "Power System Dynamics, Stability and Control", Interline Publishers, Bangalore, 1996.
2. P. Kundur, "Power System Stability and Control", McGraw Hill Inc, New York, 1995.
3. P. Sauer and M. A. Pai, "Power System Dynamics and Stability", Prentice Hall, 1997.
4. E.W. Kimbark, "Power systems Stability", Vol. I and III.

PCC: Power Electronics Application to Power Systems

Teaching Scheme
Lectures: 3 hrs/week
Tutorial : 1 hr/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam – 60

Course Outcomes:

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

A. Classify and explain the functioning of FACTS devices.
B. Model FACTS devices to control the power flow and optimize transmission capacity.
C. Identify the need for HVDC systems.
D. Identify converters for HVDC application and discuss their control characteristics.
E. Compare the HVAC and HVDC systems.

Syllabus Contents:

The concept of flexible AC transmission – reactive power control in electrical power transmission lines, uncompensated transmission line, Introduction to FACTS devices and its importance in transmission Network, Introduction to basic types of FACTS controllers**,** Shunt Compensation: Methods of Var generation: Thyristor controlled reactor (TCR), Thyristor switched capacitor (TSC), Fixed capacitor- Thyristor controlled reactor (FC-TCR), STATCOM; Series Compensation : Thyristor Switched Series Capacitor (TSSC), Thyristor Controlled Series Capacitor (TCSC). Static Synchronous Series Compensator (SSSC), modes of operation, Voltage regulator and Phase Angle Regulator (PAR), Multi functional FACTS controller**:** The Unified Power Flow Compensator (UPFC); circuit and steady-state characteristic; effect on transmission line compensation; Interline Power Flow Controller (IPFC); circuit and steady-state characteristic; H**VDC:** Introduction, various possible HVDC configurations, components of HVDC system, operation of 6-pulse and 12-pulse converter, Effect of source inductance, Generation of Harmonics, Design of AC filters and DC filters, HVDC light and HVDC PLUS Series and Parallel operation of converters**.**

References:

1. K. R. Padiyar , " HVDC Power Transmission System", Wiley Eastern Limited, New Delhi , First Edition 1990.
2. T.J.E. Miller , " Reactive Power Control in Electrical System", John Wiley and Sons, New York , 1982.
3. N.G.Hingorani, "Understanding FACTS :Concepts and Technology of FACTS Systems", IEEE Press, 2000.
4. K.R.Padiyar "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. 2007.
5. A.T.John, "Flexible AC Transmission System", Institution of Electrical and Electronic Engineers (IEEE) 1999.

6. Colin Adamson and N.G.Hingorani ," High Voltage Direct Current Power Transmission", Garraay Limited, London 1960.
7. J.Arrillaga, " High Voltage Direct Current Transmission", Peter Pregnnus, London 1983.
8. Edward Wilson Kimbark," Direct Current Transmission", Vol.1 ileyInterscience, New
9. York London Sydney 1971.
10. NarinG.Hingorani, "Power Electronics in Electric Utilities: Role of Power Electronics in Future power systems", Proc. of IEEE, Vol.76, no.4, April 1988.
11. EinarV.Larsen, Juan J. Sanchez-Gasca, Joe H. Chow, "Concepts for design of FACTS Controllers to damp power swings", IEEE Trans On Power Systems, Vol.10, No.2, May 1995.
12. Gyugyi L., "Unified power flow control concept for flexible AC transmission", IEEE Proc-C Vol.139, No.4, July 1992.

PCC: Digital Protection

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each
End-Sem Exam – 60

Course Outcomes:

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

A. Select and model various components (like CT, CVT, and numerical relay) for protection purpose.
B. Use and implement least squares, DFT, FFT phasor estimation algorithms for numerical protection.
C. Design and simulate over current, distance and differential protection schemes for power systems.
D. Develop the advanced schemes for power system protection using new technologies such as synchronized measurements, PMUs, GPS, fiber optics.

Syllabus Contents:

Review of principles of power system protection: over current, directional, differential and distance protection, review of sequence networks and short circuit analysis, relay coordination: over current and distance relay coordination, introduction to current transformer and potential transformer, standards, effect on relaying philosophy, introduction to computer aided relaying, motivation, basic

hardware, digital signal processing aspects, sampling, aliasing, anti-aliasing filter, Fourier and discrete Fourier transform recursive DFT, half cycle and full cycle algorithm, estimation of phasors and frequency, algorithms for transmission line protection, out-of-step relaying, introduction to adaptive relaying and wide area measurements(WAM), transformer, generator and bus bar protection.

References:

1. Prof. S. A. Soman, "A Web Course on Digital protection of power system", IIT Bombay.
2. A. G. Phadke, J. S. Thorp, "Computer relaying for power systems", research studies press ltd. England, John Wiley and sons inc., New York.
3. Blackburn, "Protection of power systems".
4. Y. G. Paithankar, S. R. Bhide, "Fundamentals of power system protection", Prentice Hall, India.

Department Elective I

Students may choose any elective offered by the department.

DEC : Power System Transients

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each
End-Sem Exam - 60

Course Outcomes:

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

A. Define, classify, interpret and model the transient phenomena in power system.
B. Simulate the transients using EMTP/ATP software.
C. Analyze transient phenomena and develop the strategies to mitigate associated problems.
D. Evaluate the transient process due to lightning.

Syllabus Contents:

Sources of electrical transients, basic concepts, definitions, causes, effects, basic mathematical concepts for transient analysis, Laplace transform and differential equations, representation of transient wave shapes, modelling power apparatus for transient analysis, capacitor switching, reactor switching, magnetizing inrush and ferroresonance, transmission lines, the wave equation, and line terminations, travelling wave attenuation and distortion, transients due to faults, electromagnetic

induction, magnetic flux, and currents, transient electromagnetic phenomena, lightning induced transients, computation of lightning events, lightning protection using shielding and surge arresters, transient voltages and grounding practices, numerical simulation of electrical transients, simulation tools, international standards.

References:

1. Pritindra Chaudhari, "Electromagnetic transients in Power System", PHI.
2. J.C. Das, "Transients in Electrical Systems", McGraw-Hill, 2010.
3. A. Greenwood, "Electrical Transients in Power Systems", Wiley-Interscience, 1991.
4. L. van der Sluis, "Transients in Power Systems", Wiley, 2001.
5. J.A. Martinez-Velasco, "Power System Transients: Parameter Determination", CRC Press, 2009.
6. L.V. Bewley, "Traveling Waves on Transmission Systems".
7. H. W. Dommell, EMTP Theory Book.
8. Alternate Transients Program Rule Book.

DEC: Renewable Energy Systems

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam – 60

Course Outcomes:

At the end of the course the students will be able to,

A. Appreciate the importance of energy crises and consequent growth of the power generation from the renewable energy sources and participate in solving these problems.
B. Demonstrate the knowledge of the physics of wind power and solar power generation and all associated issues so as to solve practical problems.
C. Demonstrate the knowledge of physics of solar power generation and the associated issues.
D. Identify, formulate and solve the problems of energy crises using wind and solar energy.
E. Identify the possible research avenues in the field of wind and solar.

Syllabus Contents:

Historical development and current status, characteristics of wind power generation, network integration issues, generators and power electronics for wind

turbines, power quality standards for wind turbines, technical regulations for interconnections of wind farm with power systems, isolated wind systems, reactive power and voltage control, economic aspects, impacts on power system dynamics, power system interconnection experience in the world, introduction of solar systems, merits and demerits, concentrators, various applications, solar thermal power generation, PV power generation, cost effectiveness, tidal power, geothermal, biomass.

References:

1. Thomas Ackermann, Editor, "Wind power in Power Systems", John Willy and sons ltd.2005.
2. Siegfried Heier, "Grid integration of wind energy conversion systems", John Willy and sons ltd., 2006.
3. K. Sukhatme and S.P. Sukhatme, "Solar Energy", Tata MacGraw Hill, Second Edition, 1996
4. Mukund Patel, "Wind and Solar Power Systems", CRC Press, 1999.
5. Gilbert M. Master, "Renewable and efficient electric power systems" John Wiley and Sons, 2004.

DEC: Electrical Power Distribution Systems

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam – 60

Course Outcomes:

At the end of the course the students will be able to,

A. Plan the distribution system for given application.
B. Design primary and secondary distribution systems
C. Address the protection and reliability issues in distribution systems
D. Analyze and model unbalanced distribution systems in presence of DGs
E. Design active network management

Syllabus Contents:

Overview of power distribution systems, objectives and goals, physical layout, standards and requirements, Distribution network planning, distribution transformers, grounding and protection, Medium and long term load forecasting, three phase network modelling, analysis of unbalance networks, Distribution load flow, Distribution state estimation, Distribution losses, Reliability considerations and bench marking, Distributed generation (DG), distribution planning in presence of DGs, grid integration of DG,

protection issues with DG, Electric vehicles, impact on forecasts, planning for charging networks, Battery storage systems sizing and location, Design of active networks, economic considerations of power distribution, microgrid and hybrid systems

References:

1. Electric Power Distribution System Engineering (Second Edition), Turan Gönen (Taylor & Francis), ISBN: 1-4200-6200-X and Research papers

DEC: Restructured Power Systems

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam – 60

Course Outcomes:

After completion of the course students will acquire the skill to,

A. Describe various types of regulations in power systems.
B. Identify the need of regulation and deregulation.
C. Define and describe the Technical and Non-technical issues in Deregulated Power Industry.
D. Identify and give examples of existing electricity markets.
E. Classify different market mechanisms and to summarize the role of various entities in the market.
F. Define and describe various pricing mechanisms in the Generation, Transmission and Distribution sector.

Syllabus Contents:

Fundamentals of restructured system, market architecture, load elasticity, social welfare maximization, OPF: role in vertically integrated systems and in restructured markets, congestion management, optimal bidding, risk assessment and hedging, transmission pricing and tracing of power, ancillary services, standard market design, distributed generation in restructured markets, developments in India, IT applications in restructured markets, working of restructured power systems : PJM.

References:

1. Lorrin Philipson, H. Lee Willis, “Understanding electric utilities and de-regulation”, Marcel Dekker Pub.,1998. • Steven Stoft, “Power system economics: designing markets for electricity”, John Wiley and Sons, 2002.

2. Kankar Bhattacharya, Jaap E. Daadler, Math H. J. Boolen, "Operation of restructured power systems", Kluwer Academic Pub., 2001.
3. Mohammad Shahidehpour, Muwaffaq Alomoush, "Restructured electrical power systems: operation, trading and volatility", Marcel Dekker.

Department Elective – II

Students may choose any elective offered by the department.

DEC : Smart Grid Technologies

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each
End-Sem Exam - 60

Course Outcomes:

At the end of the course the students will be able to,

A. Differentiate conventional and smart grid
B. Identify the need of smart grid, micro grid, smart metering, smart storage, hybrid vehicles, home automation, smart communication
C. Express the need and specify the components of smart grid and smart communication.

Syllabus Contents:

Introduction to smart grid, smart grid vision and road map in India, Concept of Resilient and self Healing Grid, Present international developments, smart cities, RTU, IED, PMU, smart substations, feeder automation, PHEV, V2G, G2V, CAES, real time prizing, AMR, OMS, smart sensors, Home and building automation, GIS, Concept of microgrid, architecture, DC micro grid, issues, integration of renewable energy sources, cyber controlled smart grid, Power quality and EMC in micro grid, web based PQ monitoring, smart grid communication architecture, WAMS, HAN, NAN, WAN, Bluetooth, ZigBee, GPS, Wi-Fi Max based communication, wireless network, cloud computing, cyber security, BPL, IP based protocols.

References:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai, "Integration of green and renuable energy in electric power systems, John Weily.
2. Clark W. Gellings, 'Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press.
3. Stuart Borlase, "Smart Grids-Infrastructures, Technology and Soluations", CRC Press, Taylor and Francis group.
4. Janaka Ekanayake, Kithsiri Liyanage, J. Wu and Akihiko Yokoyama, 'Smart Grid-

Technology and Applications, John Wily.

DEC : Energy Storage Systems

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam – 60

Course Outcomes:

At the end of the course the students will be able to,

A. Understand the emerging needs of Electrical Energy Storage Systems.
B. Analyze the performance of various Electrical Energy Storage Systems.
C. Assess the markets for the Electrical Energy Storage Systems.

Syllabus Contents:

The Role of Electrical Energy Storage Technologies in Electricity use. Emerging needs of Electrical Energy Storage (EES), The roles of EES, Types of Electrical Energy Storage Systems, Classification, Mechanical, Electrochemical, Chemical, Electrical, Thermal Energy Storage systems, Standards and Safety involved, Areas of applications of EES, Markets and forecast for EES.

References:

1. IEC White paper on Electrical Energy Systems:
i. *www.iec.ch/whitepaper/pdf/iecWP*
2. Energy Storage Systems, Volume I and II, EOLSS, *www. eolssunesco@gmail.com*
3. Energy Storage for Power Systems, A. G. Ter-Gazarian, Institution of Engineering and Technology, 2011.

DEC: Power Quality and Reliability

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam - 60

Course Outcomes:

Upon successful completion of this course, students should be able to,

A. Understand various power line disturbances and how the quality of the power gets deteriorated.
B. Identify the sources of each type of power line

C. Find out the remedies for each type of disturbance
D. Identify and use various equipment for measuring these disturbances.

Syllabus Contents:

Terms and definitions, voltage sags and interruptions: sources of sags and interruptions, end user issues, transient over voltages: sources of transient overvoltages, devices for overvoltage protection, load switching transient problems, harmonics: harmonic distortion, total harmonic distortion, triplen harmonics, effects of harmonic distortion, locating sources of harmonics, modelling harmonic sources, computer tools for harmonic analysis, long duration voltage variations: devices for voltage regulation, capacitors for voltage regulations, regulating utility voltages with dispersed sources, monitoring and measurement of power quality.

Reliability evaluation of power systems: verifications, theoretical developments.

References:

1. Roger Dugan, H. Wayne, "Electrical power systems quality". McGraw Hill, 2002
2. Alexander Kusko and Marc T. Thompson, "Power quality in electrical systems".
3. Arindam Ghosh, Gerard Ledwich, "Power Quality Enhancement using Custom Power Devices".
4. Math H. J. Bolen, "Understanding Power Quality Problems", IEEE power series on Power Engineering.

DEC: High Voltage Engineering and Switchgear

Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/week	T1, T2 – 20 marks each, End-Sem Exam – 60

Course Outcomes:

At the end of this course students will demonstrate the ability to:

A. Propose the proper insulating medium / system; based on the insulation strength of the material for applying to high voltage systems.
B. Measure the high voltages and currents.
C. Design the high voltage laboratory and the equipment installations in it.
D. Carry out HV tests on various equipments e. g. Cables, CBs, Insulators etc, using relevant testing IS and be able to give analysis of the test results.

Syllabus Contents:

Breakdown in Gases, Breakdown in liquid and solid Insulating materials, Generation of High Voltages, Measurements of High Voltages and Currents, Design, Planning & Layout of H. V. Laboratories, High Voltage Testing of Electrical Apparatus, M. V. Switchgear- ACB,VCB,SF 6, H.V. DC Circuit Breakers, Relays, Testing Methods .

References:

1. High Voltage Engineering Fundamentals by E. Kuffel, W. S. Zaengl, J. KuffelNewnes Publication, ISBN-0-7506-3634-3
2. High Voltage and Electrical Insulation Engineering by Ravindra Arora, WolfGang Mosch New Age International Publishers Ltd. Wiley Eastern Ltd., ISBN-978-0-470-60961-3
3. Various IS standards for HV Laboratory Techniques and Testing
4. Protection and Switchgear by B. Bhalja, R.P. Maheshwari and Nilish G. Chothani. OXFORD University Press, fifth reprint 2014.

DEC: Embedded System Design

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam – 60

Course Outcomes:

At the end of the course, students will demonstrate the able to

A. Illustrates memory organization
B. Test and debug peripherals in embedded system
C. Understand RTOS
D. Design small embedded system

Syllabus Contents:

Systems on chip, memory subsystem, Bus Structure, Interfacing protocol, Peripheral interfacing, testing & debugging, Power management, Software for embedded Systems, Software programming optimization, concurrent programming. Real time scheduling, I/O Management, Embedded Operating Systems, Networked embedded systems. Designing Embedded Systems, Special networking protocols (CAN Bluetooth) applications. Developing Embedded Systems, Building Dependable Embedded Systems.

References:

1. "Embedded Systems Design" by Steve Heath. Publisher: Butterworth-Heinemann. Principles of Embedded computing system design, Wyne woff Mprgan koffman publication 2000
2. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
3. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011
4. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
5. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
6. 7. Embedded Systems – Lyla, Pearson, 2013

LC : Hardware Laboratory

Teaching Scheme
Lectures: 6 hrs/week

Examination Scheme
Continuous Assessment- 50 Marks
Final Practical/Oral Exam – 50 Marks

Course Outcomes:

After completion of the course students will acquire the skill to,

A. Select a suitable microcontroller for a targeted task.
B. Code for the selected microcontroller.
C. Install and maintain the compilation and debug tools.
D. Solve a given task efficiently.

Syllabus Contents: This lab includes experiments on study of interrupts, timer, I/O operations, ADC interfacing, programming of microcontroller and DSPs, interfacing with LED display (single, 7 segment/relay) SPWM generation, control of electric motors, implementation of DFT/FFT algorithms, FIR and IIR filters and other relevant advanced applications.

References: Data sheets of DSP, ADC, microcontrollers etc.

MLC-: Intellectual Property Rights

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam - 60

Course Outcomes:

After studying this course student will be able to,

A. Be vigilant and enlightened to generate new ideas.
B. Appreciate the importance of IP in the institution of an efficiently organized society.
C. Understand that how IPR are sources of national wealth and mark of an economic leadership in the context of global market scenario.

Syllabus Contents:

Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. international Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs. Registered and unregistered trademarks, design, concept, idea patenting.

References:

1. Halbert, "Resisting Intellectual Property",Taylor and Francis Ltd ,2007.
2. Mayall, "Industrial Design by Mayall, Mc Graw Hill.
3. Product Design by Niebel, Mc Graw Hill.
4. Introduction to Design by Asimov, Prentice Hall.
5. Intellectual Property in New Technological Age by Robert P. Merges, Peter S. Menell, Mark A. Lemley.
6. Intellectual Property Rights Under WTO by T. Ramappa, S. Chand.

LLC: Liberal Learning Course

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam – 60

Course Outcomes:

After completion of this course students will be able to

A. Learn new topics from various disciplines without any structured teaching or tutoring
B. Understand qualitative attributes of a good learner
C. Understand quantitative measurements of learning approaches and learning styles
D. Understand various sources and avenues to harvest/gather information
E. Access yourself at various stages of learning

Course Features:

- 10 Areas, Sub areas in each
- Voluntary selection
- Areas (Sub areas):
    1. Agriculture (Landscaping, Farming, etc.)
    2. Business (Management, Entrepreneurship, etc.)
    3. Defense (Study about functioning of Armed Forces)
    4. Education (Education system, Policies, Importance, etc.)
    5. Fine Arts (Painting, Sculpting, Sketching, etc.)
    6. Linguistics
    7. Medicine and Health (Diseases, Remedies, Nutrition, Dietetics, etc.)
    8. Performing Arts (Music, Dance, Instruments, Drama, etc.)
    9. Philosophy
    10. Social Sciences (History, Political Sc., Archeology, Geography, Civics, Economics, etc.)

Evaluation:

- **T1:** A brief format about your reason for selecting the area, sub area, topic and a list of 5 questions (20 marks)

- **T2:** Identify and meet an expert (in or outside college) in your choice of topic and give a write up about their ideas regarding your topic (video /audio recording of your conversation permitted (20 marks)

- **ESE:** Presentation in the form of PPT, demonstration, performance, charts, etc. in front of everyone involved in your sub area and one external expert (60 marks)

Resources:

- Expert (s), Books, Texts, Newspaper, Magazines, Research Papers, Journal, Discussion with peers or faculty, Internet, etc.

SEMESTER III

PCC : Project Stage I

Course Outcomes:

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

A. Implement innovative ideas in the field of power systems.
B. Prepare precise technical project reports for publishing in internationally recognized journals and also conferences.
C. Enhance presentation skills
D. Take up any challenging job in industry.

Work Contents: The M. Tech. project is aimed at training the students to analyze independently any problem in the field of Electrical Engineering or interdisciplinary. The project may be analytical, computational, experimental or a combination of three. The project report is expected to show clarity of thoughts and expression, critical appreciation of the existing literature and analytical, experimental, computational aptitude.

The student progress of the dissertation work will be evaluated in stage I (after semester III) by the departmental evaluation committee.

References: Various books, research papers on the topic selected for the dissertation.

SLC-: Project and Finance Management

Teaching Scheme
Lectures: 3 hrs/week (Mooks Course)

Examination Scheme
T1, T2 – 20 marks each,
End-Sem Exam - 60

Course Outcomes:

After studying this course student will be able to,

A. Demonstrate project management skills
B. Analyze risk and manage it.
C. Illustrate project financial evaluation

Syllabus Contents:

Project organization and contracts, Construction finance,Public-private partnerships in

financing of infrastructure, Private finance initiative, Project finance, How to get involved in private finance, Risk analysis, Risk management, Project financial evaluation, Capital program management, Project control, Project management engineering, procurement and construction, Identifying and covering risks—current trends, Project uncertainty management. Term project presentation

References:

1. Online Mooks course material available in the selected area.

SEMESTER IV

PCC : Project Stage II

Course Outcomes:

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

A. Implement innovative ideas in the field of power systems.
B. Prepare good technical project reports for publication in journals and conferences.
C. Enhance presentation skills.
D. Take up any challenging job in industry.

Work Contents: The M. Tech. project is aimed at training the students to analyze independently any problem in the field of Electrical Engineering or interdisciplinary. The project may be analytical, computational, experimental or a combination of three. The project report is expected to show clarity of thoughts and expression, critical appreciation of the existing literature and analytical, experimental, computational aptitude.

The student progress of the dissertation work will be evaluated in stage II (after semester IV) by the departmental evaluation committee and final viva voce will be conducted by the external examiner.

References: Various books, research papers on the topic selected for the dissertation.