



AISSMS **INSTITUTE OF INFORMATION TECHNOLOGY** **(IOIT)**



ADDING VALUE TO ENGINEERING

An Autonomous Institute Affiliated to Savitribai Phule Pune University
Approved by AICTE, New Delhi and Recognised by Govt. of Maharashtra
Accredited by NAAC with "A+" Grade | NBA - 5 UG Programmes

ACADEMIC COURSE STRUCTURE

AND

DETAILED CURRICULUM OF

First Year M. TECH **Program - Electrical Engineering**

M. Tech 2 Year PG Curriculum **(2025 Pattern)**

AISSMS INSTITUTE OF INFORMATION TECHNOLOGY

**Kennedy Road, Near
RTO,**

**Pune – 411 001, Maharashtra State,
India Email: principal@aissmsioit.org,**

Website: <https://aissmsioit.org/>

Institute Vision & Mission

Vision

To be recognized amongst top 10 private engineering colleges in Maharashtra by the year 2026 by rendering value added education through academic excellence, research, entrepreneurial attitude, and global exposure.

Mission

To enable placement of 150 plus students in the 7 lacs plus category & ensure 100% placement of all final year students

To connect with 10 plus international universities, professional bodies and organizations to provide global exposure to students

To create conducive environment for career growth, prosperity, and happiness of 100% staff.

To be amongst top 5 private colleges in Pune in terms of admission cut off.

Quality Policy

We commit ourselves to provide quality education & enhance our student's quality through continuous improvement in our teaching and learning processes.

Department Vision & Mission

VISION

To be known for imparting quality education in the field of electrical engineering and preparing competent professionals with high human values to serve society.

MISSION

- To train the graduates with the latest technologies through industry institute interactions and experiential teaching learning practices to meet the emerging global challenges.
- To enhance engineering skills, employability skills, and research through professional activities.
- To develop globally competent electrical engineers with professional ethics and commitment to society.

PROGRAM EDUCATION OBJECTIVES

Graduates will

- Investigate problems in electrical engineering and provide effective solutions.
- Excel in the professional career, research, higher studies, and entrepreneurship.
- Engage in lifelong learning by adapting a professional, social, and ethical attitude for contributing to societal needs.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: The graduates will be able to proficiently employ the software tools used in the design and analysis of electrical systems.

PSO2: The graduates will be able to acquire skills in electric mobility, power quality, and renewable energy.

Program Outcomes (POs)

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. [Engineering knowledge]
2. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. [Problem analysis]
3. 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. [Design/development of solutions]
4. 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. [Conduct investigations of complex problems]
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. [Modern tool usage]
6. 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. [The engineer and society]
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. [Environment and sustainability]
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. [Ethics]
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. [Individual and teamwork]
10. 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. [Communication]
11. 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. [Project management and finance]
12. 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. [Life-long learning]

SEMESTER WISE STRUCTURES

M. Tech. (Power Electronics and Drives) – First Year (Semester –I)											
Sr. No.	Course Code	Course Title	Hours per week			Credits	Examination scheme				
			L	T	P		ISE	ESE	TW	OR/ Presentation	Total
1	PEPCC901	Applied Mathematics for Power Electronics Systems	3	--	--	03	40 [#]	60*	--	--	100
2	PEPCC902	Modeling and Analysis of Electrical Machines	4	--	--	04	40 [#]	60**	--	--	100
3	PEPCC903	Power Converters	4	--	--	04	40 [#]	60**	--	--	100
4	PEPCC904	Lab Practice I @@	--	--	4	02	--	--	50	50	100
5	PEPEC905	Elective-I	3	--	--	03	40 [#]	60*	--	--	100
6	PEELC906	Research Methodology MOOC	3	--	--	03	40\$	60\$\$	--	--	100
7	PEHSM907	Audit Course I (A. Introduction to Constitution/ B. Renewable Energy Studies)	1	--	--	01	--	--	25	--	25
Total			18	00	04	20	200	300	75	50	625

L- Lecture, T- Tutorial, P- Practical

Elective-I
A. Power Electronics for Renewable Energy Systems
B. Control Design Techniques for Power Electronic Systems
C. Power Electronics and FACTS Devices

* **End Semester Examination (ESE)** based on subjective questions.

** **Practical or Activity based Evaluation.**

In Semester Evaluation

In Semester I : Subjective Examination.

In Semester II: Examination - based on Presentation/ Group Discussion/ Laboratory Work/ Course Project/ Home Assignment/ Comprehensive Viva Voce/ Blog Writing/ Case Study/ Survey/ Multiple-Choice Questions (MCQ)/ Numerical based Subjective Questions.

\$ **For MOOCs:** Assignments marks will be converted on the scale of 40 marks.

\$\$ **For MOOCs:** Score of examination conducted by the respective authority of MOOC or Score of ESE Conducted by Institute will be converted on the scale of 60 marks.

MOOC: Research Methodology : https://onlinecourses.nptel.ac.in/noc24_ge41/preview

Note: @@ Passing is mandatory in both the examination heads to gain total Course Credits.

M. Tech. (Power Electronics and Drives) – First Year (Semester –II)											
Sr. No.	Course Code	Course Title	Hours per week			Credits	Examination scheme				
			L	T	P		ISE	ESE	TW	OR/ Presentation	Total
1	PEPCC1001	AC and DC Drives	3	--	--	03	40 [#]	60*	--	--	100
2	PEPCC1002	Analysis and Design of Inverters	3	--	--	03	40 [#]	60*	--	--	100
3	PEPCC1003	Advanced Microcontroller Applications	4	--	--	04	40 [#]	60**	--	--	100
4	PEPCC1004	Advance Power Electronics MOOC	4	--	--	04	40\$	60\$\$	--	--	100
5	PEPCC1005	Lab Practice II @@	--	--	4	02	--	--	50	50	100
6	PEPEC1006	Elective-II MOOC	3	--	--	03	40\$	60\$\$	--	--	100
7	PEHSM1007	Audit Course-II (A. Human Values in Ethics and Education/ B. Disaster Management)	1	--	--	01	--	--	25	--	25
Total			18	00	04	22	200	300	75	50	625

L- Lecture, T- Tutorial, P- Practical

Elective-II (MOOC)	
A. Design of Power Electronic Converters	https://onlinecourses.nptel.ac.in/noc25_ee87/preview
B. Smart Grid : Basics to Advanced Technologies	https://onlinecourses.nptel.ac.in/noc25_ee79/preview
C. Power Quality Improvement Techniques	https://onlinecourses.nptel.ac.in/noc25_ee65/preview
D. EV- Electric Vehicle Dynamics and Electric Motor Drives	https://nptel.ac.in/courses/108107157
E. Machine Learning for Engineering and Science Applications	https://onlinecourses.nptel.ac.in/noc25_cs49/preview

* **End Semester Examination (ESE)** based on subjective questions.

** **Practical or Activity based Evaluation.**

In Semester Evaluation

In Semester I : Subjective Examination.

In Semester II: Examination - based on Presentation/ Group Discussion/ Laboratory Work/ Course Project/ Home Assignment/ Comprehensive Viva Voce/ Blog Writing/ Case Study/ Survey/ Multiple-Choice Questions (MCQ)/ Numerical based Subjective Questions.

\$ **For MOOCs:** Assignments marks will be converted on the scale of 40 marks.

\$\$ **For MOOCs:** Score of examination conducted by the respective authority of MOOC or Score of ESE Conducted by Institute will be converted on the scale of 60 marks.

MOOC : Advance Power Electronics : https://onlinecourses.nptel.ac.in/noc25_ee02/preview

Note: @@ Passing is mandatory in both the examination heads to gain total Course Credits.

First Year M.Tech Power Electronics and Drives

Applied Mathematics for Power Electronics Systems (PEPCC901)

Course Code:	PEPCC901	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	External	60

Course Objective:

1	Enable students to know matrix theory.
2	To give basic knowledge about probability and statistical concepts
3	To discuss problems using various statistical techniques
4	To provide knowledge of tools of mathematics to problems in engineering.

Course Outcomes: Students will be able to

901.1	Apply matrix theory in different problems of engineering.
901.2	Apply basic concepts of probability.
901.3	Organize, present and interpret statistical data.
901.4	Model and analyze measurement data using the appropriate distribution.
901.5	Apply knowledge of applied mathematics in analyzing real world problems of engineering.

Topics covered:

UNIT I:	Numerical Analysis and Transform theory	(8 hrs.)
Introduction, Interpolation Formulae, Difference equation, Roots of Equations, Solution for ordinary and partial differential equations. Special matrices, Eigen values and Eigen vectors, Diagonalization of matrices, Orthogonal symmetrical matrices, Skew matrices. Generalized Eigenvectors, Canonical basis, QR Factorization, Cholesky, Singular value decomposition. Fourier Series and Transform.		
UNIT II:	Probability and Random Variable	(6 hrs.)
Probability, Axioms of probability, Conditional probability, Baye's theorem, Random variables, Probability function, Moments, Moment generating functions and their properties, Binomial, Poisson, Geometric, Uniform, Exponential, Beta, Gamma and Normal distributions, Function of a random variable, Covariance, Correlation and Regression Analysis.		
UNIT III:	Statistics	(6 hrs.)
Types of measured quantity- discrete & continuous distributed, Histogram, Central tendency of data, Median and mean of data, Geometric and harmonic mean - computation - properties and uses, Measures of dispersion, Range, quartile, standard deviation and co-efficient of variation.		
UNIT IV:	Normal Distribution	(6 hrs.)
Gaussian distribution and its properties, Area under normal distribution, Standardized normal distribution, Central limit theorem, Chi-square test.		

UNIT V:	Graphical Data Analysis	(6 hrs.)
Equation of approximate curves, Determination of parameters in linear relationships: Graphical method, Method of sequential differences, Method of extended differences, Method of least squares.		
UNIT VI:	Linear Programming	(4 hrs.)
Formulation of Linear Programming (LP) Problems, Methods of solution LP Problem- Simplex, Big M, Graphical and Two phase. Transportation and Assignment Models.		

Reference Books:	
1	Peter V. O'Neil, Cengage Learning, Canada , “Advanced Engineering Mathematics”
2	B.C. Nakra, K.K. Chaudhry, “Instrumentation, Measurement & Analysis”, Tata McGraw Hill, 2004
3	Chi-T Song Chen, “Linear Systems Theory and Design”, 3rd Edition, Oxford University Press
4	Andrews L.C. and Phillips R.L., “Mathematical Techniques for Engineers and Scientists”, Prentice Hall of India Pvt. Ltd., New Delhi, 2005.
5	Bronson, R. “Matrix Operation”, Schaum’s outline series, 2nd Edition, McGraw Hill, 2011
6	Johnson, R.A., Miller, I and Freund J., “Miller and Freund’s Probability and Statistics for Engineers”, Pearson Education, Asia, 8th Edition, 2015.
7	Veerarajan,T. “Probability, Statistics and Random Processes”.3rd ed., Tata Mc Graw- Hill, 2008.
8	Grewal, B.S., “Higher Engineering Mathematics”, 43rd Edition, Khanna Publishers, 2015
9	Taha, H.A., “Operations Research, An Introduction”, 9th Edition, Pearson education, New Delhi, 2016.
10	Vittal, P.R. & V.Malini.”Statistical and Numerical Methods”.Margham Publications

First Year M.Tech Power Electronics and Drives

Modeling and Analysis of Electrical Machines (PEPCC902)

Course Code:	PEPCC902	Credit	04
Contact Hours:	4 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination Practical or Activity based Evaluation	External	60

Course Objective:

1	To elaborate various linear and non-linear models for analysis of steady-state and dynamic machine performance estimation.
2	To explain concepts of representing transfer function model of different electrical machines.
3	To illustrate concept of 3-phase to 2-phase conversion.
4	To elaborate representation of 3-phase induction motor in various reference frames and Linearization of machine equations
5	To explain modelling of 3-phase synch. Motor in 2- axis representation and linearization of machine equations.

Course Outcomes: Students will be able to

902.1	Apply the various linear and non-linear models for analysis of steady-state and dynamic machine performance estimation.
902.2	Have an appreciation of the simplifying assumptions associated with the various modelling techniques.
902.3	Determine the dynamic model of an induction machine and determination of torque.
902.4	Determine the torque developed in a salient pole synchronous machine using the Park's transformation and identify contribution of saliency torque-damping torque and excitation torque.
902.5	Apply the modelling techniques to novel or other machine technologies

Topics covered:

UNIT I:	Generalized Machine Theory	(8 hrs.)
Elements of generalized circuit theory, basic electrical machine, conventions used, Kron's primitive machine, leakage flux in machines with more than two windings, voltage equations, matrix form, torque equations, power in AC circuits		
UNIT II:	Linear Transformations in Machines	(8 hrs.)
Linear Transformations in machines: Power invariance, transformations from displaced brush axis, transformations from 3-phase to 2-phase, transformation from rotating axes to stationary axes, Transformed impedance matrix.		
UNIT III:	DC Machine	(8 hrs.)
Separately excited DC motor-steady state and transient state analysis, sudden application of inertia load, transfer function of separately excited DC motor, mathematical model of dc series motor, shunt motor. Brushless DC motor.		

UNIT IV:	Modelling of Three Phase Induction Machine	(8 hrs.)
Generalized model in arbitrary frame, Voltage, torque equations, Induction motor models-stator reference frame model, rotor reference frame model, synchronously rotating reference frame model, equations in flux linkages, per unit model, dynamic simulation.		
UNIT V:	Modelling of Synchronous Machines	(8 hrs.)
Construction and operation of synchronous motors. Model of a two-phase permanent-magnet synchronous motor. Static and dynamic characteristics. Open-loop control, stepping and microstepping. Closed-loop quadrature control. DQ transformation and DQ model. Closed-loop control in the DQ frame of reference. Torque optimization and field weakening. Hybrid stepper motors and reluctance motors.		
UNIT VI:	Alternative forms of Machine Equations	(8 hrs.)
Linearization of machine equations, Small displacement stability: Eigen values, Eigen values of typical induction machine and synchronous machine. Performance prediction of -Induction machine, synchronous machine with stator electric transients neglected Construction, modeling, and characteristics of Brushless DC motor		

Textbooks:

- 1 R. Krishnan, "Electric Motor Drives - Modeling, Analysis & Control", PHI Learning Private Ltd, 2009.
- 2 P. C. Krause, Oleg Wasynczuk, Scott D. Sudhoff, "Analysis of Electrical Machinery and Drive Systems", IEEE Press, John Wiley and Sons
- 3 P. S. Bimbra, "Generalized Theory of Electrical Machines", Khanna Publications
- 4 Mrittunjay Bhattacharyya, "Electrical Machines : Modelling and Analysis", PHI Publications
- 5 R. Ramanujam, "Modeling and Analysis of Electrical Machine", Dreamtech Press

Reference Books:

- 1 Chee-Mun Ong, "Dynamic Simulation of Electric Machinery using Matlab / Simulink", Prentice Hall, 1998.
- 2 Matrix Analysis of Electric Machines, N. N. Hancock, Pergamon Press.
- 3 Matrix Analysis of Electric Machines by Mukhopadhyay

First Year M.Tech Power Electronics and Drives

Power Converters (PEPCC903)

Course Code:	PEPCC903	Credit	04
Contact Hours:	4 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination Practical or Activity based Evaluation	External	60

Course Objective: To impart knowledge on

1	The performance analysis and operation of various converters.
2	The dynamics of various converters.
3	The designing concepts of various converters

Course Outcomes: Students will be able to

903.1	Illustrate the operating principle and construction of various types of converters.
903.2	Demonstrate knowledge of dynamics of various converters.
903.3	Design various converters.

Topics covered:

UNIT I:	Inverters	(8 hrs.)
Single and three phase bridge inverters with R, RL and RLE loads, Voltage control, Harmonic reduction, square wave inverters, PWM inverters, modulation techniques, SPWM, Selective Harmonic Elimination PWM and delta modulation. blanking time. harmonic spectrum and comparison among different PWM techniques. Boost inverter. Current source inverters, Inverter Circuit Design.		
UNIT II:	Resonant Pulse Converters	(8 hrs.)
Series and parallel resonant inverters - zero current and Zero voltage switching resonant converters, frequency response. Two quadrant zero voltage switching resonant converters, Resonant dc link inverters, design and analysis, soft switching, load dependent problem.		
UNIT III:	Cycloconverters	(8 hrs.)
Single phase and three phase cycloconverters with R, RL and RLE loads – Voltage control , Harmonic analysis, operation waveforms designs.		
UNIT IV:	AC Voltage Controllers	(8 hrs.)
Single phase and three phase ac voltage controllers with R, RL and RLE loads, Voltage control, Harmonic analysis, operation waveforms PWM, Matrix converter, design.		
UNIT V:	Dynamics of Converters	(8 hrs.)
Modelling and control of inverters, resonant pulse converters, cyclo-converters, ac voltage controllers. Application of microcomputer.		
UNIT VI:	Control Design	(8 hrs.)
Method for control design: averaging method, small signal analysis, linearization, challenge. Geometric control: hysteresis control, boundary control. Triggering circuit. Design of inverters, resonant pulse converters, cycloconverters, ac voltage controllers circuits. PLL / Microcomputer based inverters, cycloconverters, and AC voltage controllers.		

Reference Books:

- 1 Joseph Vithayathil, "Power Electronics - Principles and Applications", McGraw Hill Inc., New York, 1995
- 2 Vedam Subrahmanyam, "Power Electronics", New Age International (P) Limited, New Delhi, 1996
- 3 R. Bausiere & G. Seguier, Power Electronic Converters, Springer- Verlag, 1987.
- 4 D. M. Mitchell, DC-DC Switching Regulator Analysis McGraw Hill, 1987

First Year M.Tech Power Electronics and Drives

Lab Practice I (PEPCC904)

Course Code:	PEPCC904	Credit	02
Contact Hours:	4 Hrs./week (P)	Type of Course:	Practical
Examination Scheme	Term-work 50 marks	Oral/Presentation 50 marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work	Internal	50
2.	Oral/Presentation Examination	External	50

Course Objective:

1	To develop thinking skills.
2	To develop data analysis skills.
3	To develop experimental skills.
4	To develop communication skills.

Course Outcomes: Students will be able to

904.1	Design simulation of electrical machines.
904.2	Analyze harmonics of three phase Induction motor
904.3	Analyse THD in inverter output using Harmonic analyser.
904.4	Design simulation to analyse converters and inverters.

List of Experiments:

Minimum eight experiments should be performed under Lab Practice I from the following list

1	Modelling and simulation of three phase Induction machine and to study the dynamic behavior of the machine for change in load torque.
2	Modelling and simulation of separately excited DC motor and to study the dynamic behavior of the machine for change in load torque.
3	Modelling and simulation of separately stepper motor and to study the dynamic behavior.
4	Analysis of harmonics of three phase Induction motor.
5	Analyse THD in inverter output using Harmonic analyser.
6	To study the harmonic analysis of CFL, electronic fan regulator, electronic choke of tube, computer –UPS.
7	Simulation & analysis of three phase converters with RLE load.
8	Simulation & analysis of Buck/Boost converters with RLE load.
9	Simulation & analysis of three phase PWM inverter with RLE load.
10	FFT analysis of three phase converter.
11	Signature analysis of induction motor current.
12	Modelling and performance analysis of solar photovoltaic system.
13	Modelling and performance analysis of wind turbine.
14	Case study of harmonic analysis of typical installation.

Reference Books:

- 1 Chee-Mun Ong, "Dynamic Simulation of Electric Machinery using Matlab / Simulink", Prentice Hall, 1998.
- 2 Matrix Analysis of Electric Machines, N. N. Hancock, Pergamon Press.
- 3 Matrix Analysis of Electric Machines by Mukhopadhyay
- 4 Joseph Vithayathil, "Power Electronics - Principles and Applications", McGraw Hill Inc., New York, 1995
- 5 Vedam Subrahmanyam, "Power Electronics", New Age International (P) Limited, New Delhi, 1996
- 6 R. Bausiere & G. Segulier, Power Electronic Converters, Springer- Verlag, 1987.
- 7 D. M. Mitchell, DC-DC Switching Regulator Analysis McGraw Hill, 1987

First Year M.Tech Power Electronics and Drives

Elective-I : A. Power Electronics for Renewable Energy Systems (PEPEC905A)

Course Code:	PEPEC905A	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	External	60

Course Objective:

1	To provide knowledge about the stand alone and grid connected renewable energy systems.
2	To equip with required skills to derive the criteria for the selection of power converters for renewable energy applications.

Course Outcomes: Students will be able to: able to

905A.1	Analyze the impacts of renewable energy generation on environment.
905A.2	Explain the importance and qualitative analysis of solar and wind energy sources.
905A.3	Select appropriate converter for PV & wind energy conversion and their performance characteristics.
905A.4	Explain various converters for solar PV and wind energy systems.

Topics covered:

UNIT I	Introduction	(06 Hrs)
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment -Qualitative study of different renewable energy resources:- ocean/tidal, Biomass, Hydrogen energy systems : operating principles and characteristics of: Solar PV, Fuel cells, wind electrical systems-control strategy, operating area.		
UNIT II	Power converters	(06 Hrs)
Line commutated inverters, matrix converter, buck, boost converters, PWM inverters, grid interactive inverters, back to back converters, Synchronized operation with grid supply - Harmonic problem - Grid connectors concepts - Wind farm and its accessories - Grid related problems - Generator control - Performance improvements - Different schemes - AC voltage controllers - Harmonics and PF improvement.		
UNIT III	Wind Energy Systems	(06 Hrs)
Basic Principle of wind Energy conversion - Nature of Wind - Wind survey in India - Power in the wind - Components of Wind Energy Conversion System (WECS)- Performance of Induction Generators (SCIG and DFIG) and PMSGs for WECS Three phase AC voltage controllers-AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, matrix converters- Standalone operation of fixed and variable speed wind energy conversion systems-Grid Connection Issues -Grid integrated PMSG and SCIG Based WECS.		
UNIT IV	Solar photo voltaic system-	(06 Hrs)
Working of solar photo voltaic system: Smart charge controller, line commutated converters (inversion-mode) - Boost and buck-boost converters-selection of inverter for PV plant, battery sizing, array sizing- standalone PV systems - Grid tied and grid interactive inverters- grid connection issues.		

UNIT V	Interfacing in Renewable Energy Systems	(06 Hrs)
Control methods, stability, diagnostics and interfacing of energy storage in renewable energy systems, Hybrid renewable energy storage Voltage and frequency control of grids with high penetration of renewable distributed generation.		
UNIT VI	Stability of Grid-tied Renewable Energy Sources	(06 Hrs)
Challenges of performance and stability of multivariable grid tied 3 phase inverter system of renewable sources, Case Studies & applications		

Reference Books:

- 1 S. N. Bhadra, D. Kastha, & S. Banerjee “Wind Electrical Systems”, Oxford University Press, 2009.
- 2 Rashid M. H. “Power Electronics Hand book”, Academic press, 2001.
- 3 Rai G.D, “Non conventional Energy Sources”, Khanna publishes, 1993.
- 4 Rai G.D,” Solar Energy Utilization”, Khanna publishes, 1993.
- 5 Gray, L. Johnson, “Wind Energy System”, Prentice Hall linc, 1995.
- 6 B. H. Khan, " Non-conventional Energy Sources", Tata McGraw-hill Publishing Company.
- 7 P. S. Bimbhra, “Power Electronics”, Khanna Publishers, 3rd Edition,2003.
- 8 Fang Lin Luo Hong Ye, "Renewable Energy systems", Taylor & Francis Group,2013.
- 9 R. Seyezhai and R. Ramaprabha, “Power Electronics for Renewable Energy Systems”, Scitech Publications, 2015.

First Year M.Tech Power Electronics and Drives

Elective-I : B. Control Design Techniques for Power Electronic Systems (PEPEC905B)

Course Code:	PEPEC905B	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	External	60

Course Objective:

1	To explore conceptual bridges between the fields of Control Systems and Power Electronics
2	To explain various advanced control techniques relevant to the design of controllers in Power Electronics

Course Outcomes: Students will be able to:

905B.1	Apply modern linear and nonlinear control strategies for power electronics devices
905B.2	Design appropriate controllers for modern power electronics devices
905B.3	Apply different stability concepts in the context of linear and nonlinear systems

Topics covered:

UNIT I:	Classical and Modern Control Concept	(06 Hrs)
Proportional Integral and Derivative (PID) control, State space method, analysis and design of control system in state space,		
UNIT II:	Approximate Linearization Methods	(06 Hrs)
Pole placement by state feedback, state observer, design of control system with Luenberger observer. Reduced Order Observer		
UNIT III:	Optimal Control	(06 Hrs)
Performance Indices, Linear Quadratic Regulator, Dynamic Programming, Pontryagin's Minimum Principle.		
UNIT IV:	Sliding Mode Control	(06 Hrs)
Sliding Mode Control: Introduction, chattering, chattering attenuation, concept of equivalent control, sliding mode equation, sliding surface design, Gao's reaching laws, regular form.		
UNIT V:	Nonlinear Control Methods	(06 Hrs)
Nonlinear Systems and Equilibrium Points, Concepts of Stability, Linearization, Stability analysis of nonlinear systems, Feedback Linearization, Input-output linearization, Input-State Linearization.		
UNIT VI:	Stability	(06 Hrs)
Introduction to Stability, Basic definitions of Stability, Stability of Linear Systems, Stability of Nonlinear Systems, Lyapunov's Indirect Method.		

Reference Books:

1	Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall India, 5 th Edition, 2010.
2	Jean-Jacques E. Slotine, "Applied Non Linear Control", Prentice Hall Englewood Cliffs, New Jersey.
3	Sarah K. Spurgeon, "Sliding-mode Control: Theory and applications", Taylor & Francis, 1998
4	Stanislaw H Zak, "Systems and Control", Oxford University Press, 2003.

First Year M.Tech Power Electronics and Drives

Elective-I : C. Power Electronics and FACTS Devices (PEPEC905C)

Course Code:	PEPEC905C	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	External	60

Course Objective:

1	To emphasize the need for FACTS controllers.
2	To learn the characteristics, applications and modelling of series and shunt FACTS controllers.
3	To analyze the interaction of different FACTS controller and perform control coordination

Course Outcomes: Students will be able to:

905C.1	Understand the operation of the compensator and its applications in power system.
905C.2	Understand the various emerging Facts controllers.
905C.3	Know about the genetic algorithm used in Facts controller coordination.

Topics covered:

UNIT I:	Introduction	(6 hrs.)
Need for FACTS controllers, types of FACTS controllers, Brief Description and Definitions of FACTS Controllers, Benefits from FACTS Technology.		
UNIT II:	Static VAR Compensator (SVC)	(6 hrs.)
Thyristor Controlled Reactor (TCR) - Thyristor Switched Reactor (TSR) - Thyristor Switched Capacitor (TSC) - Fixed Capacitor - Thyristor Controlled Reactor (FC-TCR) - Thyristor Switched Capacitor - Thyristor Controlled Reactor (TSC -TCR) – V-I Characteristics of Static Var Compensator (SVC) - Advantages of slope in dynamic Characteristic – Voltage control by SVC – Design of SCV voltage regulator		
UNIT III:	Thyristor And GTO Thyristor Controlled Series Capacitors (TCSC and GCSC)	(6 hrs.)
Concepts of Controlled Series Compensation – Operation of TCSC and GCSC- Analysis of TCSC- GCSC – Modelling of TCSC and GCSC for load flow studies- modeling TCSC and GCSC for stability studied- Applications of TCSC and GCSC.		
UNIT IV:	Voltage Source Converter Based Facts Controllers	(6 hrs.)
Principle of Operation of STATCOM, A Simplified Analysis of a Three Phase Six Pulse STATCOM, Analysis of a Six Pulse VSC Using Switching Function, Multi-pulse Converters, Control of Type 2 Converters, Control of Type 1 Converter, Multilevel Voltage Source Converters, Harmonic Transfer and Resonance in VSC, Applications of STATCOM		
UNIT V:	Controllers And Their Coordination	(6 hrs.)
FACTS Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination.		

UNIT VI:	Dynamic Voltage Restorer And Unified Power Quality Conditioner	(6 hrs.)
Introduction, Dynamic Voltage Restoration, Series Active Filtering, A Case Study on DVR, Unified Power Quality Conditioner, A Case Study on UPQC		

Reference Books:	
1	A.T.John, “Flexible AC Transmission System”, Institution of Electrical and Electronic Engineers (IEEE), 1999.
2	NarainG.Hingorani, Laszio. Gyugyl, “Understanding FACTS Concepts and Technology of Flexible AC Transmission System”, Standard Publishers, Delhi 2001.
3	V. K.Sood, “HVDC and FACTS controllers- Applications of Static Converters in Power System”, 2004, Kluwer Academic Publishers
4	Mohan Mathur, R., Rajiv. K. Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc.
5	K.R.Padiyar,” FACTS Controllers in Power Transmission and Distribution”, New Age International(P) Ltd., Publishers New Delhi, Reprint 2008,

First Year M.Tech Power Electronics and Drives

Research Methodology (PEELC906)

Course Code:	PEELC906	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation (Assignment Marks)	Internal	40
2.	End-sem. Examination	Internal / External	60

Course Link : https://onlinecourses.nptel.ac.in/noc24_ge41/preview

Course Layout :

Week 1 : A group discussion on what is research; Overview of research;

Week 2 : Literature survey , Experimental skills;

Week 3 : Data analysis, Modelling skills;

Week 4 : Technical writing; Technical Presentations; Creativity in Research

Week 5 : Creativity in Research; Group discussion on Ethics in Research

Week 6 : Design of Experiments

Week 7 : Intellectual Property

Week 8 : Department specific research discussions

Books and References :

- 1 Kothari, C.R., Research Methodology: Methods and Techniques. New Age International
- 2 Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, 2nd Edition, APH Publishing Corporation
- 3 Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., An introduction to Research Methodology, RBSA Publishers
- 4 Suresh Sinha, Anil K Dhiman, Research Methodology, ESS Publications, Volumes 2
- 5 Day R.A., How to Write and Publish a Scientific Paper, Cambridge University Press
- 6 Wadehra, B.L. Law relating to patents, Trade Marks, copyright designs and geographical indications. Universal Law Publishing.
- 7 Leslie Lamport, ' Latex: A document preparation system' Addison Wesley, Reading, Massachusetts, second edition, 1994, ISBN 0-201-52983-1

First Year M.Tech Power Electronics and Drives

Audit Course-I: A. Introduction to Constitution (PEHSM907A)

Course Code:	PEHSM907A	Credit	01
Contact Hours:	1 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	Term-work 25 marks		

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work Evaluation	Internal	25

Course Objective:

1	To realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
2	To identify the importance of fundamental rights as well as fundamental duties.
3	To understand the functioning of Union, State and Local Governments in Indian federal system.
4	To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.

Course Outcomes: Students will be able to

907A.1	Understand the philosophy of Constitution of India.
907A.2	Understand their freedoms and responsibilities.

Topics covered:

UNIT I:	Philosophy of the Indian Constitution	(3 hrs.)
a) Constitutional History of India b) Role of Dr. B. R. Ambedkar in Constituent Assembly c) Preamble - Source and Objects d) Sovereign and Republic e) Socialist and Secular f) Democratic - Social and Economic Democracy g) Justice - Social, Economic and Political h) Liberty - Thought, Expression, Belief, Faith and Worship i) Equality - Status and Opportunity j) Fraternity, Human Dignity, Unity and Integrity of the Nation		
UNIT II:	Fundamental Rights	(4 hrs.)
a) Right to equality b) Right to freedoms c) Right against exploitation d) Right to freedom of religion e) Cultural and educational rights f) Right to property g) Right to constitutional remedies		

UNIT III:	Directive Principles of State Policy	(4 hrs.)
a) Equal Justice and free legal aid b) Right to work and provisions for just and humane conditions of work c) Provision for early childhood, Right to education and SC,ST, weaker section d) Uniform Civil Code e) Standard of Living, nutrition and public health f) Protection and improvement of environment g) Separation of Judiciary from executive h) Promotion of International peace and security		
UNIT IV:	Fundamental Duties	(3 hrs.)
a) Duty to abide by the Constitution b) Duty to cherish and follow the noble ideals c) Duty to defend the country and render national service d) Duty to value and preserve the rich heritage of our composite culture e) Duty to develop scientific temper, humanism, the spirit of inquiry & reform f) Duty to safeguard public property and abjure violence g) Duty to strive towards excellence		

Reference Books:	
1	D. D. Basu, Introduction to the Constitution of India, LexisNexis.
2	Granville Austin, The Constitution of India: Cornerstone of a Nation, Oxford University Press
3	Subhash Kashyap, Our Constitution, National Book Trust
4	M. P. Jain, Indian Constitutional Law, LexisNexis
5	V. N. Slnkla, Constitution of India, Eastern Book Company
6	P. M. Bakshi, The Constitution of India , Universal Law Publishing
7	M. V. Pylee, Constitutional Government in India , S. Chand
8	V. S. Khare, Dr. B. R. Ambedkar and India's National Security

First Year M.Tech Power Electronics and Drives

Audit Course-I: B. Renewable Energy Studies (PEHSM907B)

Course Code:	PEHSM907B	Credit	01
Contact Hours:	1 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	Term-work 25 marks		

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work Evaluation	Internal	25

Course Objective:

1	To explain basic engineering processes.
2	To teach design and analysis of the performance parameters of wind and solar generation system.

Course Outcomes: Students will be able to

907B.1	Analyze and represent renewable system data.
907B.2	Perform basic assessment and design of a renewable electrical energy system for a given application.
907B.3	Determine the requirements for interconnecting a renewable electrical energy system to the utility electric power grid.

Topics covered:

UNIT I:	Fundamentals of Wind Energy and Wind Turbine	(7 hrs.)
Wind energy fundamentals, types of wind turbines, wind turbine technology, wind turbine components, modern wind turbine control and monitoring system.		
UNIT II:	Fundamental of Solar Systems	(7 hrs.)
Solar cell fundamentals, classification of photovoltaic (PV) systems, PV system components, PV system applications.		

Reference Books:

1	Michael Boxwell, "Solar Electricity Handbook - 2015 Edition".
2	Krauter, Stefan C. W. , "Solar Electric Power Generation - Photovoltaic Energy Systems" Springer Pub.
3	Heinrich Haberlin, "Photovoltaics System Design and Practice by Wiley Pub.
4	A. K. Mukerjee, Nivedita Thakur, "Photovoltaics System Analysis And Design", PHI LEARNING.
5	Bin Wu, Yongqiang Lang, Navid Zargari, Samir Kouro, " Power Conversion and Control of Wind Energy Systems", IEEE – Wiley Pub.
6	Tony Burton, Nick Jenkins, David Sharpe, Ervin Bossanyi, "Wind Energy Handbook, 2 nd Edition" Wiley Pub.
7	Sathyajith, Mathew, "Wind Energy . Fundamentals, Resource Analysis and Economics", Springer Pub.

M. Tech. (Power Electronics and Drives) – First Year (Semester –II)

<u>First Year M. Tech Power Electronics and Drives</u>			
AC and DC Drives (PEPCC1001)			
Course Code:	PEPCC1001	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	External	60

Course Objective:

1	To understand the stable steady-state operation and transient dynamics of a motor-load system.
2	To study and analyse the operation of the converter, chopper fed dc drive.
3	To study and understand the operation of both classical and modern induction motor drives.
4	To study and analyse the operation of Reluctance Motor, PMSM and BLDC drives.

Course Outcomes: Students will be able to:

1001.1	Analyse the operation of the converter, chopper fed dc drive.
1001.2	Analyse the operation of both classical and modern induction motor drives.
1001.3	Demonstrate knowledge of controls of Synchronous motor drives
1001.4	Demonstrate knowledge of Operation of Reluctance Motor, PMSM and BLDC drives.

Topics covered:

UNIT I:	Review of Conventional Drives	(6 hrs.)
Speed –torque relation, Steady state stability, methods of speed control, braking for DC motor – Multi quadrant operation, Speed torque relation of AC motors, Methods of speed control and braking for Induction motor, Synchronous motor. Criteria for selection of motor for drives.		
UNIT II:	Control of DC Drives	(6 hrs.)
Converter Control of DC Drives: Analysis of series and separately excited DC motor with single phase and three phase converters operating in different modes and configurations. Chopper Control of DC Drives: Analysis of series and separately excited DC motors fed from different choppers for both time ratio control and current limit control, four quadrant control.		
UNIT III:	Design of DC Drives	(6 hrs.)
Single quadrant variable speed chopper fed DC drives, Four quadrant variable speed chopper fed DC Drives, Single phase/ three phase converter, Dual converter fed DC Drive, current loop control, Armature current reversal, Field current control, Different controllers and firing circuits, simulation.		
UNIT IV:	Control of Induction Motor Drive	(6 hrs.)
Slip power recovery drives – Static Kramer Drive – Phasor diagram – Torque expression – speed control of Kramer Drive – Static Scherbius Drive – modes of operation. Vector control of Induction Motor Drives: Principles of Vector control – Vector control methods – Direct methods of vector control – Indirect methods of vector control – Adaptive control principles – Self tuning regulator Model referencing control.		

UNIT V:	Control of Synchronous Motor Drives	(6 hrs.)
Synchronous motor and its characteristics – Control strategies – Constant torque angle control – Unity power factor control – Constant mutual flux linkage control. Controllers: Flux weakening operation – Maximum speed – Direct flux weakening algorithm – Constant Torque mode controller – Flux Weakening controller – indirect flux weakening – Maximum permissible torque – speed control scheme – Implementation strategy speed controller design.		
UNIT VI:	Variable Reluctance and Brushless DC Motor Drives	(6 hrs.)
Variable Reluctance motor drive – Torque production in the variable reluctance motor Drive characteristics and control principles – Current control variable reluctance motor service drive. Three phase full wave Brushless dc motor – Sinusoidal type of Brushless dc motor- current controlled Brushless dc motor Servo drive.		

Reference Books:	
1	Electric Motor Drives Pearson Modelling, Analysis and control – R. Krishnan – Publications – 1 st edition – 2002.
2	Modern Power Electronics and AC Drives B K Bose – Pearson Publications 1 st edition
3	Power Electronics and Control of AC Motors – MD Murthy and FG Turn Bull Pergman Press, 1 st edition
4	Power Electronics and Variable frequency drives – BK Bose – IEEE Press – Standard publications - 1 st edition – 2002.
5	Fundamentals of Electrical Drives – G.K. Dubey – Narora publications – 1995

First Year M. Tech Power Electronics and Drives

Analysis and Design of Inverters (PEPCC1002)

Course Code:	PEPCC1002	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	External	60

Course Objective:

1	To provide the electrical circuit concepts behind the different working modes of inverters so as to enable deep understanding of their operation.
2	To equip with required skills to derive the criteria for the design of inverters for UPS, drives etc.
3	To analyze and comprehend the various operating modes of different configurations of inverters
4	To design different single phase and three phase inverters.
5	To impart knowledge on multilevel inverters and modulation techniques.

Course Outcomes: Students will be able to:

1002.1	Explain basic principles of inverters and models of operation of different types of inverters
1002.2	Select appropriate topologies for inverters
1002.3	Design the power stage with controllers for various applications.
1002.4	Apply advanced modulation techniques for analyzing and designing inverters.

Topics covered:

UNIT I:	Single Phase Inverters	(6 hrs.)
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 – forced commutated thyristor inverters.		
UNIT II:	Three Phase Voltage Source Inverters	(6 hrs.)
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 – Application to drive system.		
UNIT III:	Current Source Inverters	(6 hrs.)
Operation of six-step thyristor inverter – inverter operation modes – load – commutated inverters – Auto sequential current source inverter (ASCI) – current pulsations – comparison of current source inverter and voltage source inverters – PWM techniques for current source inverters.		
UNIT IV:	Multilevel & Boost Inverters	(6 hrs.)
Multilevel concept – diode clamped – flying capacitor – cascade type multilevel inverters - Comparison of multilevel inverters - application of multilevel inverters – PWM techniques for MLI – Single phase & Three phase Impedance source inverters.		

UNIT V:	Resonant Inverters And Power Conditioners	(6 hrs.)
Series and parallel resonant inverters - voltage control of resonant inverters – Class E resonant inverter – resonant DC - link inverters.-power line disturbances-power conditioners-UPS: offline UPS, online UPS.		
UNIT VI:	Modern Inverters and Gating Circuits	(6 hrs.)
Resonant inverters - Series and parallel - Class E series inverter - ZCS and ZVS concepts - Resonant DC link inverters - Gating circuit for single phase complementary commutated inverter - Logic circuit for three phase current source inverter.		

Reference Books:

- 1 Rashid M. H., "Power Electronics Circuits, Devices and Applications ", PrenticeHall India, Third Edition, New Delhi, 2004.
- 2 Jai P. Agrawal, "Power Electronics Systems", Pearson Education, Second Edition, 2002
- 3 Bimal K. Bose "Modern Power Electronics and AC Drives", Pearson Education, Second Edition, 2003
- 4 M. H. Rashid, "Power Electronics: Circuits, Devices and Application", Pearson, Education of India, 2011
- 5 P. S. Bimbhra, "Power Electronics", Khanna Publishers, Delhi, 4th Edition, 2006.

First Year M. Tech Power Electronics and Drives

Advanced Microcontroller Applications (PEPCC1003)

Course Code:	PEPCC1003	Credit	04
Contact Hours:	4 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination Practical or Activity based Evaluation	External	60

Course Objective:

1	To explain the architecture of PIC 18F458 microcontroller.
2	To demonstrate programming of PIC18F458 microcontroller in C language programs.
3	To interface various devices with PIC18F458.

Course Outcomes: Students will be able to:

1003.1	Describe architecture of PIC microcontroller.
1003.2	Develop a program PIC microcontroller for various applications.
1003.3	Interface I/O devices with PIC microcontroller and develop programs to control different types of motors.

Topics covered:

UNIT I:	PIC Architecture	(8 hrs.)
CISC and RISC architectures, Architecture of PIC 18F458 microcontroller. Embedded C concepts. Port Programming.		
UNIT II:	Timer and Interrupt Programming of PIC18F458 Microcontroller	(8 hrs.)
Timers in PIC microcontroller programming of timers in C for generation of delay. Interrupt Structure of PIC microcontroller and Programming External interrupts.		
UNIT III:	Special Hardware Features and Programming of PIC18F458 Microcontroller	(8 hrs.)
Serial Port Structure and its programming, CCP module in PIC 18F458 microcontroller, Applications of CCP mode.		
UNIT IV:	PIC Microcontroller Based Data Acquisition and Control	(8 hrs.)
PIC ADC Programming ADC. Interfacing of sensors using PIC microcontroller. Interfacing DAC.		
UNIT V:	Interfacing of Motors and Output Devices with PIC Microcontroller	(8 hrs.)
DC motor control, Stepper Motor Interfacing, Servo motor interfacing, Interfacing of LCD and Keyboard, Relay and Opt isolator.		
UNIT VI:	Microcontroller Based Application Development	(8 hrs.)
Induction Motor control (VSI and CSI fed) , UPS Applications , Special Machine control (PMBLDC). Design of a closed loop temperature monitoring system using PIC microcontroller.		

Reference Books:

- 1 PIC Microcontroller and Embedded Systems Using Assembly and C for PIC18 by Muhammad Ali Mazidi, Rolind D. McKinley, Danny Causey, Pearson Education.
- 2 Fundamentals of Microcontrollers and Applications in Embedded Systems with PIC by Ramesh Gaonkar, Thomson and Delmar learning, First Edition.
- 3 Programming And Customizing the PIC Microcontroller by Myke Predko, TATA McGraw-Hill.
- 4 PIC microcontroller: An introduction to software and Hardware interfacing by HanWay-Huang Thomson Delmar Learning.
- 5 MICROCHIP Technical Reference Manual of 18F4520 Embedded Design with PIC 18F452 Microcontroller by John B. Peatman, Prentice Hall.
- 6 PIC Microcontroller and Embedded Systems Using Assembly and C for PIC18 by Muhammad Ali Mazidi, Rolind D. McKinley, Danny Causey, Pearson Education.

First Year M. Tech Power Electronics and Drives

Advance Power Electronics (PEPCC1004)

Course Code:	PEPCC1004	Credit	04
Contact Hours:	4 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	Internal/External	60

Course Link : https://onlinecourses.nptel.ac.in/noc25_ee02/preview

Course Layout :

Week 1: Power Electronics Devices: An Introduction:

- Advanced solid-state devices: MOSFETs, IGBT, GTO, IGCT etc.
- Wide band gap devices (SiC and GaN)
- Power modules, intelligent power modules, gating circuits.
- Design of snubbers
- Thermal design, protection.
- Digital signal processors used in their control.

Week 2: Choppers and Non-isolated DC-DC Converters:

- Choppers: Step-Down, Step-Up, Class-B, Class-C, Class-D, Class-E and Multi-Phase.
- Non-isolated DC-DC Converters: Buck, boost, buck-boost, Cuk, SEPIC, Zeta in DCM and CCM.

Week 3: Isolated DC-DC Converters and Power Factor Correction Converter:

- Isolated DC-DC Converters: Flyback, Forward, Cuk, SEPIC, Zeta, Half Bridge, Push-Pull and Bridge in DCM and CCM.
- Single-phase, Single-Stage Converters (SSSSC), Power Factor Correction at AC Mains in These Converters. Applications in SMPS, UPS, Welding, Lighting and EV Charging.

Week 4: Power Quality: An Introduction:

- Power Quality Monitoring, instrumentation and regulations.
- Static Series and Shunt Power Electronics Voltage Quality Controllers
- Modern Arrangement for Reduction of Voltage Fluctuation.
- Active Power Line Conditioner

Week 5: Multiphase Converter and HVDC Systems:

- 12-Pulse Converter Based HVDC Systems.
- Multipulse And Multilevel VSC Based Flexible HVDC Systems.

Week 6: Improved Power Quality AC-DC Converters:

- Single-Phase Improved Power Quality AC-DC Converters: Buck, Boost, Buck-Boost,
- PWM VSC (Voltage Source Converters),
- Multilevel VSCs, PWM CSC (Current Voltage Source Converters)

Week 7: Three-Phase and Multipulse Improved Power Quality AC-DC converters:

- Three-Phase Improved Power Quality AC-DC converters: VSC, Multilevel VSCs, Multipulse VSCs,
- PWM CSC (Current Controlled Voltage Source Converters).
- Multipulse AC-DC Converters: Diode and Thyristor-Based Converters

Week 8: Multilevel Inverter: Introduction

- Multilevel Inverter and its Control.
- Detailed PWM Analysis for Multilevel Inverter.
- Modular Multilevel Converter

Week 9: Multilevel Inverter Drive:

- Multilevel Inverter Fed Induction Motor Drive.
- Harmonic Suppression and Modulation technique for Multipulse Converter Fed Multilevel Inverter-Based IM Drive.
- Power Quality Improvement in Multi-Pulse Converter Fed Multilevel Inverter Based Induction Motor Drives.

Week 10: Resonant Converter:

- Analysis and principle of operation of Resonant Converter.
- Series and Parallel Resonant Inverters.
- Zero Voltage Switching Resonant Converters.
- Zero Current Switching Resonant Converter.
- Quasi Resonant and Multi Resonant DC-DC Power Converters.
- Phase-Controlled Resonant Converters

Week 11: Solid State Controllers for Motor Drives:

- Solid State Controllers for Motor Drives: Vector Control and Direct Torque Control of Induction, Synchronous, Permanent Magnet Sine Fed, Synchronous Reluctance Motors.
- Permanent Magnet Brushless DC (PMLDC) Motors and Switched Reluctance Motors.

Week 12: LCI fed Synchronous Motor Drives and Power Quality Improvement of the Drive:

- Introduction
- LCI (Load Commutated Inverter) Fed Large Rating Synchronous Motor Drives.
- Energy Conservation and Power Quality Improvements in These Drives

Books and References:

1. R. S. Ramshaw, "Power Electronics Semiconductor Switches", Champman & Hall, 1993.
2. N. Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics, Converter, Application and Design", Third Edition, John Willey & Sons, 2004.
3. B. Jayant Baliga, "Fundamentals of Power Semiconductor Devices", springer, USA, 2019.
4. Peter Wellmann, Noboru Ohtani, Roland Rupp, "Wide Bandgap Semiconductors for Power Electronics," Wiley-VCH, 2022, Germany.
5. R. W. Erickson, "Fundamentals of Power Electronics", Kluwer Academic Publishers, 1997
6. Adrian Ioinovici, "Power Electronics and Energy Conversion Systems (Volume-1 Fundamentals and Hard-switching Converters)" Wiley Publication, 2013 UK.
7. Fang lin Luo, Hong Ye, "Advanced DC/DC Converters", CRC Press Taylor & Francis Group, 2017
8. L. Umanand, "Power Electronics Essentials and applications", Willey, 2009, NewDelhi.
9. M. H. Rashid, "Power Electronics, circuits, Devices and Applications", Second Edition, Prentice-Hall, 1995, India.
10. K. Billings, "Switch Mode Power Supply Handbook", McGraw-Hill, 1999, Boston.
11. Bhim Singh, Ambrish Chandra and Kamal Al-Haddad , "Power Quality Problems and Mitigation Techniques" Wiley, 2017, India.
12. N. G. Hingorani and L. Gyugyi, "Understanding FACTS", IEEE Press, Delhi, 2001.
13. B. K. Bose, "Power Electronics and Variable Frequency Drive", Standard Publishers Distributors, 2000.
14. Bin Wu, "High-Power Converters and AC Drives", IEEE Press, A John Wiley & Sons, Inc Publication, New York, 2006.
15. Vijay K. Sood, "HVDC and FACTS Controllers -Applications of Static Converters in Power Systems", Kluwer Academic Publishers, Masachusetts, 2004.
16. J. Arrillaga, Y. H. Liu and N. R. Waston, "Flexible Power Transmission-The HVDC Options", John Wiley & Sons, Ltd, Chichester, UK, 2007.
17. R. C. Duagan, M. F. Mcgranaghan and H. W. Beaty, "Electric Power System Quality", McGraw-Hill, 2001, 1221 Avenue of the Americas, New York.
18. Haitham Abu-Rub, Mariusz Malinowski, Kamal Al-Haddad, "Power Electronics for Renewable Energy systems Transportation and Industrial Applications", IEEE Press and Wiley, 2014, UK.
19. G. T. Heydt, "Electric Power Quality", Stars in a Circle Publications, second edition, 1994, Avarua, Rarotonga, Cook Islands.

First Year M. Tech Power Electronics and Drives

Lab Practice II (PEPCC1005)

Course Code:	PEPCC1005	Credit	02
Contact Hours:	4 Hrs./week (P)	Type of Course:	Practical
Examination Scheme	Term-work 50 marks	Oral/Presentation 50 marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work Evaluation	Internal	50
2.	Oral/Presentation Examination	External	50

Course Objective:

1	To develop thinking skills.
2	To develop data analysis skills.
3	To develop experimental skills.
4	To develop communication skills.

Course Outcomes: Students will be able to

1005.1	Design simulation of electrical drives.
1005.2	Analyze power quality analysis of UPS loads / drives used in industry.
1005.3	Design and analysis of snubber circuit.
1005.4	Design and simulation of sliding mode control for double integrating system.

List of Experiments:

Minimum eight experiments should be performed under Lab Practice II from the following list

1	Modeling and simulation of Chopper fed DC drive.
2	Study of the performance characteristics of vector controlled three phase Induction motor.
3	Study of performance characteristics of BLDC motor drive.
4	Power Quality Analysis of UPS loads / Drives used in industry.
5	Power Quality audit and Report on effect of renewables on power quality parameters in an electrical network grid
6	To study the performance characteristics of Switched Reluctance motor.
7	Simulation of three phase voltage regulator.
8	Design and analysis of snubber circuit.
9	Design of heat sink.
10	Design of Luenberger observer for DC motor drive.
11	Design and simulation of finite time Linear Quadratic Regulator (LQR).
12	Design and simulation of sliding mode control for double integrating system.
13	Analysis of closed loop control of converter based system.
14	Study of Power Quality Analyser -Class A- Fluke 435 (II)/430 (II), Elspec.

Reference Books:

- 1 Chee-Mun Ong, "Dynamic Simulation of Electric Machinery using Matlab / Simulink", Prentice Hall, 1998.
- 2 Matrix Analysis of Electric Machines, N. N. Hancock, Pergamon Press.
- 3 Matrix Analysis of Electric Machines by Mukhopadhyay
- 4 Joseph Vithayathil, "Power Electronics - Principles and Applications", McGraw Hill Inc., New York, 1995
- 5 Vedam Subrahmanyam, "Power Electronics", New Age International (P) Limited, New Delhi, 1996
- 6 R. Bausiere & G. Seguier, Power Electronic Converters, Springer- Verlag, 1987.
- 7 D. M. Mitchell, DC-DC Switching Regulator Analysis McGraw Hill, 1987

First Year M. Tech Power Electronics and Drives

Elective-II: Design of Power Electronic Converters (PEPEC1006A)

Course Code:	PEPEC1006A	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	Internal/External	60

Course Link : https://onlinecourses.nptel.ac.in/noc25_ee87/preview

Course Layout :

Week 1: Analysis of power electronic converters

Week 2: Power semiconductor devices

Week 3: Gate drivers

Week 4: Snubber design

Week 5: Thermal Design

Week 6: Magnetics Design

Week 7: Electromagnetic interference in power electronic converters

Week 8: Familiarity and design on power electronic hardware

Books and References:

1. Ned Mohan, Tore M. Undeland, William P. Robbins, Power Electronics: Converters, Applications, and Design, 3rd Ed. Wiley, 2007.
2. Muhammad H. Rashid, Power Electronics: Circuits, Devices and Applications, 4th Ed. Pearson Education, 2017.

First Year M. Tech Power Electronics and Drives

Elective-II: Smart Grid : Basics to Advanced Technologies (PEPEC1006B)

Course Code:	PEPEC1006B	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	Internal/External	60

Course Link : https://onlinecourses.nptel.ac.in/noc25_ee79/preview

Course Layout :

Week 1: Introduction to Smart Grid-I.
Introduction to Smart Grid-II.
Architecture of Smart Grid system
Standards for Smart Grid system
Elements and Technologies of Smart Grid System-I

Week 2: Elements and Technologies of Smart Grid System-II
Distributed Generation Resources-I
Distributed Generation Resources-II
Distributed Generation Resources-III
Distributed Generation Resources-IV

Week 3: Introduction to energy storage devices
Different types of energy storage technologies
Analytical modelling of energy storage devices
Optimal sizing and siting of storages
Battery management system (BMS)

Week 4: Wide area Monitoring Systems-I
Wide area Monitoring Systems-II
Phasor Estimation-I
Phasor Estimation-II
Digital Relays for Smart Grid Protection

Week 5: Islanding Detection Techniques-I
Islanding Detection Techniques –II
Islanding Detection Techniques –III
Smart Grid Protection-I
Smart Grid Protection-II

Week 6: Smart Grid Protection-III
Smart Grid Protection-IV
Modelling of storage devices
Modelling of DC smart grid components
Operation and control of AC Microgrid-I

- Week 7:** Operation and control of AC Microgrid -II
 Operation and control of DC Microgrid -I
 Operation and control of DC Microgrid -II
 Operation and control of AC-DC hybrid Microgrid -I
 Operation and control of AC-DC hybrid Microgrid -II
- Week 8:** Phasor measurement unit placement
 Cyber security and resiliency
 Virtual inertia and ancillary support
 Demand side management of smart grid
 Demand Response Analysis of smart grid
- Week 9:** Demonstration of solar power generation
 Demonstration of wind power generation
 Demonstration of Battery Management System
 Demonstration of EV charging system
 Hierarchical control techniques in hybrid ac-dc microgrid
- Week 10:** Simulation and case study of AC Microgrid
 Simulation and case study of DC Microgrid
 Simulation and case study of AC-DC Hybrid microgrid
 Demonstration of parallel inverter operation in AC microgrid
 Harmonic effects and its mitigation techniques
- Week 11:** Energy management
 Design of Smart Grid and Practical Smart Grid Case Study-I
 Design of Smart Grid and Practical Smart Grid Case Study-II
 System Analysis of AC/DC Smart Grid
 Demonstration of grid-connected DC microgrid
- Week 12:** Demonstration of energy management in microgrid
 Demonstration of PHIL experimentation for symmetric and asymmetric fault analysis of grid-connected DFIG wind turbine.
 Demonstration of ancillary support from virtual synchronous generator
 Demonstration on peak energy management using energy storage system.
 Conclusions

Books and References:

1. Smart power grids by A Keyhani, M Marwali.
2. Computer Relaying for Power Systems by ArunPhadke
3. Microgrids Architecture and control by Nikos Hatziargyriou
4. Renewable Energy Systems by Fang Lin Luo, Hong Ye
5. Voltage-sourced converters in power systems_ modeling, control, and applications by Amirnaser Yazdani, Reza Iravani"

First Year M. Tech Power Electronics and Drives

Elective-II: Power Quality Improvement Techniques (PEPEC1006C)

Course Code:	PEPEC1006C	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	Internal/External	60

Course Link : https://onlinecourses.nptel.ac.in/noc25_ee65/preview

Course Layout :

Week 1 : Concept of Power Quality: Frequency variations, voltage variations- sag and swell, waveform distortion –dc offset, harmonics, inter-harmonics, notching and noise.

Week 2 : Representation of harmonics, waveform, harmonic power, measures of harmonic distortion; Current and voltage limits of harmonic distortions: IEEE, IEC, EN, NORISO

Week 3 : Causes of Harmonics: 2-pulse, 6-pulse and 12-pulse converter configurations, input current waveforms and their harmonic spectrum; Input supply harmonics of AC regulator, integral cycle control, cycloconverter, transformer, rotating machines, ARC furnace, TV and battery charger.

Week 4 : Elimination/ Suppression of Harmonics: High power factor converter, multi-pulse converters using transformer connections (delta, polygon)

Passive Filters: Types of passive filters, single tuned and high pass filters, filter design criteria, double tuned filters, damped filters and their design

Week 5 : PWM Inverter: Voltage sourced active filter, current sourced active filter, constant frequency control, constant tolerance band control, variable tolerance band control.

Week 6 : Active Power Filters: Compensation principle, classification of active filters by objective, system configuration, power circuit and control strategy

Week 7 : Hybrid Shunt Active power filter: Principle of operation, analysis and modelling

Week 8 : Unified power quality conditioner, voltage source and current source configurations, principle of operation for sag, swell and flicker control

Books and References:

1. Derek A. P., "Power Electronic Converter Harmonics", IEEE Press
2. Singh B., Chandra A., AL-Haddad K., "Power Quality, Problems and Mitigation Techniques", 1st 2015 Ed., Wiley India
3. Arrillaga J., Smith B. C., Watson N. R. and Wood A. R., "Power System Harmonic Analysis", 2nd 2008 Ed., Wiley India.

First Year M. Tech Power Electronics and Drives

Elective-II: EV- Vehicle Dynamics and Electric Motor Drives (PEPEC1006D)

Course Code:	PEPEC1006D	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	Internal/External	60

Course Link : https://onlinecourses.nptel.ac.in/noc25_ee33/preview

Course Layout :

Week 01 : Introduction to Electric Vehicle

Week 02 : Vehicle Dynamics: Modelling and Simulation

Week 03 : Fundamental of Drives and Power Electronics for DC Drives

Week 04 : Modeling and Control of DC Motor Drives

Week 05 : Basics of Induction Motor and V/f Control

Week 06 : Realization of Power Electronic Converters and PWM for IM drives

Week 07 : Modelling of PMSM Drives

Week 08 : Vector Control of PMSM Drives

Week 09 :

- Modeling of general cylindrical-rotor motor in stationary reference frame and concept of different rotating frames of reference
- Review of PMSM and modeling of PMSM in RFO frame of reference
- Sensored vector control of PMSM drive

Week 10 :

- Modeling of induction motor in rotor flux-oriented reference frame
- Modeling of induction motor contd ...
- Sensored and sensor-less vector control of IM drive

Week 11 :

- Discussion of BH curve for various magnetic materials
- Principle of operation of switched reluctance
- Various configurations of SRM and computation of step angle
- Power converter realization and control of SRM
- Basics of BLDC motor drive
- Power converter realization and control of SRM

Week 12 :

- Case study of high-end EV
- Case study contd ...
- Case study contd... and conclusion

Books and References:

Iqbal Husain, ELECTRIC and HYBRIDVEHICLES, Design Fundamentals, CRC Press,2003.2. M. Ehsani, Y. Gao, S. Gay and A. Emadi,Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, CRC Press, 2005.

First Year M. Tech Power Electronics and Drives

**Elective-II: Machine Learning for Engineering and Science Applications
(PEPEC1006E)**

Course Code:	PEPEC1006E	Credit	03
Contact Hours:	3 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	In-sem. Evaluation 40 Marks	End-sem. Examination 60 Marks	

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In-sem. Evaluation	Internal	40
2.	End-sem. Examination	Internal/External	60

Course Link : https://onlinecourses.nptel.ac.in/noc25_cs49/preview

Course Layout :

Week 1: Mathematical Basics 1 – Introduction to Machine Learning, Linear Algebra

Week 2: Mathematical Basics 2 - Probability

Week 3: Computational Basics – Numerical computation and optimization, Introduction to Machine learning packages

Week 4: Linear and Logistic Regression – Bias/Variance Tradeoff, Regularization, Variants of Gradient Descent, MLE, MAP, Applications

Week 5: Neural Networks – Multilayer Perceptron, Backpropagation, Applications

Week 6: Convolutional Neural Networks 1 – CNN Operations, CNN architectures

Week 7: Convolutional Neural Networks 2 – Training, Transfer Learning, Applications

Week 8: Recurrent Neural Networks RNN, LSTM, GRU, Applications

Week 9: Classical Techniques 1 – Bayesian Regression, Binary Trees, Random Forests, SVM, Naïve Bayes, Applications

Week 10: Classical Techniques 2 – k-Means, kNN, GMM, Expectation Maximization, Applications

Week 11: Advanced Techniques 1 – Structured Probabilistic Models, Monte Carlo Methods

Week 12: Advanced Techniques 2 – Autoencoders, Generative Adversarial Network

Books and References:

1. Deep Learning, Goodfellow et al, MIT Press, 20172.
2. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 20093.

First Year M. Tech Power Electronics and Drives

Audit Course-II: A. Human Values in Ethics and Education (PEHSM1007A)

Course Code:	PEHSM1007A	Credit	01
Contact Hours:	1 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	Term-work 25 marks		

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work Evaluation	Internal	25

Course Objective:

1	To create an awareness on Engineering Ethics and Human Values.
2	To instill Moral and Social Values and Loyalty.
3	To appreciate the rights of others.
4	To create awareness on assessment of safety and risk.

Course Outcomes: Students will be able to

1007A.1	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field.
1007A.2	Identify the multiple ethical interests at stake in a real-world situation or practice.
1007A.3	Articulate what makes a particular course of action ethically defensible.
1007A.4	Assess their own ethical values and the social context of problems.
1007A.5	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects.
1007A.6	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Topics covered:

UNIT I:	Human Values	(3 hrs.)
Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality-Case Study.		
UNIT II:	Engineering Ethics	(3 hrs.)
Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self interest -Customs and religion –Uses of Ethical theories – Valuing time –Co operation –Commitment-Case Study.		
UNIT III:	Engineering as Social Experimentation	(3 hrs.)
Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons-Case study.		

UNIT IV:	Engineers Responsibility for Safety and Risk	(3 hrs.)
Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk- Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).		
UNIT V:	Global Issues	(3 hrs.)
Globalization –Cross culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research- Case Study.		

Reference Books:	
1	M. Govindarajan, S. Natarajanad, V. S. Senthil Kumar “Engineering Ethics includes Human Values” - PHI Learning Pvt. Ltd-2009.
2	Harris, Pritchard and Rabins “Engineering Ethics”, CENGAGE Learning, India Edition, 2009.
3	Mike W. Martin and Roland Schinzinger “Ethics in Engineering” Tata McGraw- Hill–2003.
4	Prof. A. R. Aryasri, Dharanikota Suyodhana “Professional Ethics and Morals” Maruthi Publications.
5	A. Alavudeen, R. Kalil Rahman and M. Jayakumaran “Professional Ethics and Human Values” –Laxmi Publications.
6	Prof. D. R. Kiran “Professional Ethics and Human Values”.
7	PSR Murthy “Indian Culture, Values and Professional Ethics” BS Publication

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Audit Course-II: B. Disaster Management (PEHSM1007B)

Course Code:	PEHSM1007B	Credit	01
Contact Hours:	1 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme	Term-work 25 marks		

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work Evaluation	Internal	25

Course Objective:

1	To explain disaster types
2	To teach to make plan for relief and strategies of disaster management

Course Outcomes: Students will be able to

1007B.1	Get knowledge about various disasters
1007B.2	Design plan for relief and strategies of disaster management

Topics covered:

UNIT I:	Disaster, Hazards and Vulnerability	(7 hrs.)
Concept of disaster, different approaches, concept of risk, levels of disasters Disaster phenomena and events, Natural and man-made hazards; response time, frequency and forewarning levels of different hazards, Characteristics and damage potential of natural hazards; hazard assessment, dimensions of vulnerability factors; vulnerability assessment, Vulnerability and disaster risk, Vulnerabilities to flood and earthquake hazards.		
UNIT II:	Disaster management mechanism and Planning	(3 hrs.)
Concepts of risk management and crisis management, Disaster management cycle Response and Recovery, Development, Prevention, Mitigation and Preparedness Planning for relief, Strategies for disaster management planning , Steps for formulating a disaster risk reduction plan, Disaster management Act and Policy in India, Organizational structure for disaster management in India, Preparation of state and district disaster management plans.		

- **Students shall submit a detailed case study report on any disaster, prevention and preparedness.**

Reference Books:

1	Alexander, D. Natural Disasters, ULC press Ltd, London, 1993.
2	Carter. W. N., Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok, 1991.
3	Chakrabarty U. K., Industrial Disaster Management and Emergency Response, Asian Books Pvt. Ltd., New Delhi 2007.
4	Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.
5	Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
6	National Policy on Disaster Management, NDMA, New Delhi, 2009.
7	Disaster Management Act. (2005), Ministry of Home Affairs, Government of India, New Delhi, 2005.
8	http://nidm.gov.in/ - National Institute of Disaster Management (NIDM) (Ministry of Home Affairs, Govt. of India) website.