With Effect from Academic Year 2018 - 2019

Department of Electrical Engineering

University College of Engineering (A),
Osmania University, Hyderabad-500 007

Department of Electrical Engineering
University College of Engineering
Osmania University
SCHEME OF INSTRUCTION & EXAMINATION
B.E. (EEE) VII Semester

S. No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P	Contact Hrs/wk	CIE	SEE	
1.	PC701EE	Power System Operation and Control	3	1	-	4	30	70	3
2.	PC702EE	Electric Drives and Static Control	3	1	-	4	30	70	3
3.	PC703EE	Utilization of Electrical Energy	3	1	-	4	30	70	3
4.	PE-IV	Professional Elective - IV	3	-	-	3	30	70	3
5.	OE-II	Open Elective - II	3	-	-	3	30	70	3
6.	PC704EE	Power Electronic Applications to Power Systems	3	1	-	4	30	70	3
7.	MC	Mandatory Course	-	-	3	3	50	-	---
Practical's									
8.	PC751EE	Electrical Simulation Lab	-	-	2	2	25	50	1
9.	PC752EE	Microprocessor and Microcontrollers Lab	-	-	2	2	25	50	1
10.	PC753EE	Power System Lab	-	-	2	2	25	50	1
11.	PW761EE	Project Work - I	-	-	2	2	50	-	4
12.	PW961EE	Summer Internship	-	-	-	-	50	-	2
			18	04	11	35	405	570	27
		PROFESSIONAL ELECTIVE-IV							
	PE701EE	Smart Grid Technologies							
	PE702EE	Electrical Machine Design							
	PE703EE	Energy Management Systems and SCADA							
		MANDATORY COURSE							
	MC951SP	Yoga Practice							
	MC952SP	NSS							
	MC953SP	Sports							
		OPEN ELECTIVE-II							
	OE701BE	Human Factor Engineering & Ergonomics							
	OE702 BE	Basic Medical Equipment							
	OE701CE	Optimization Techniques							
	OE701CS	Data Base Systems							
	OE702CS	Information Security							
	OE701EC	Principles of Electronic Communication							
	OE702EC	Fundamentals of IoT							
	OE701EE	Non Conventional Energy Sources							
	OE701ME	Startup Entrepreneurship							
	OE702ME	Finite Element Methods							

**OE701 EE Elective is not offered to the students of EE Department*

With Effect from Academic Year 2018 - 2019

Department of Electrical Engineering

University College of Engineering (A),
Osmania University, Hyderabad-500 007

Date: 30-06-2018

List of NPTEL Courses Approved for the academic year 2018-19 by BoS(EED)

Professional Elective – V

Subject	**Start Date**	**End Date**	**Exam Date**	**Registration Date**
Computational Electromagnetic & Applications	July 30,2018	Oct 19,2018	Oct 28,2018	July 30,2018 Till 5.00 PM
Design of Photo Voltaic Systems	July 30,2018	Oct 19,2018	Oct 28,2018	July 30,2018 Till 5.00 PM
Digital Image Processing	July 30,2018	Oct 19,2018	Oct 28,2018	July 30,2018 Till 5.00 PM

Open Elective – III (BME/CE/CS/EC/ME)

Subject	**Start Date**	**End Date**	**Exam Date**	**Registration** Date
Control System Design	July 30, 2018	Oct 19, 2018	Oct 28, 2018	July 30,2018 Till 5.00 PM
Electrical Distribution System Analysis	August 6,2018	September 28,2018	Oct 7,2018	August 6,2018 till 5.00 PM
FACTS Devices	August 6,2018	September 28,2018	Oct 7,2018	August 6,2018 till 5.00 PM

Note: Students can register for the above courses online and obtain the certificate from NPTEL .

PC701EE

POWER SYSTEM OPERATION AND CONTROL

Instruction	: 4 Periods per week
Duration of University Examination	: 3 Hours
SEE	: 70 Marks
CIE	: 30 Marks
Credits	: 3

Course Objectives:

- To understand the concepts and Importance of Load flow studies, Economic Operation of thermal power units, frequency control of inter connected Power System Networks.
- To make the students understand about reactive Power Control and Stability of Power System Networks.

UNIT I

Introduction, Formulation of Y bus for a system, Gauss Seidel, Newton Raphson, Decoupled an Fast decoupled methods of load flow analysis. Comparison of methods.

UNIT II

Economic operation of Power System: Input output curves — Heat rates and incremental cost curves — Equal incremental cost criterion and economic operation neglecting transmission losses. B_{mn} coefficients, economic operation including transmission losses.

UNIT III

Load Frequency Control: Governor Characteristics — Regulation of two generators in parallel — concept of control area — incremental power balance of a control area —single area control. Flat Frequency control — Flat tie line frequency control—Tie line bias control. Advantages of pool operation — Development of model for two area control.

UNIT IV

Real & Reactive Power Control: System voltage and reactive power. Effect of synchronous machine excitation, automatic voltage regulators, FACTS, Controllers - SVC, TCSC, STATCOM, Phase shifting transformers.

UNIT V

Power System Stability: Steady State Stability, Dynamic Stability, Transient Stability — the Swing equation — Equal area criterion — Application of equal area criterion — Step-by-Step solution of the swing equation —factors affecting transient stability, Introduction to voltage stability.

Suggested Reading:

1. C.L.Wadhwa, Electric Power Systems, New Age International (P) Ltd., Third Edition 2002.
2. Nagrath and Kothari, Electrical Power Systems, Tata McGraw Hill Co., Third Edition, 2004.

3. Elgerd 0, Electric Energy System Theory, McGraw Hill, 1971.
4. Hingorani, Understanding FACTS, Standard Publishing, New Delhi, 2000.
5. Hadi Saadat — Power System Analysis, Tata McGraw-Hill Edition, 2002.

PC702EE

ELECTRC DRIVES AND STATC CONTROL

Instruction	:	4 Periods per week
Duration of University Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30 Marks
Credits	:	3

Course Objectives:

- To study the static control methods of DC motor, induction motor and synchronous motor.
- To study the concepts of stability, characteristics and braking methods of DC & AC motion.
- To determine the rating of motors based on heating effects and load conditions.

UNIT I

Electric Drives: Concept and classification Dynamics of Electrical Drives: Types of loads, Torque characteristics of load. Characteristics of Motor - Load combination, Dynamics of Motor Load combination. Steady - State and Transient stability of Electric Drive. Characteristics of Electric Drives: Modified Speed * Torque characteristics of D.C. Shunt motors, D.C series motors and Induction motors.

UNIT II

Starting of Electric Motors: Methods of Starting Electric Motors, Acceleration time, Energy relations during starting, D. C Shunt & Series motors and Induction motors, Methods to reduce the energy loss during starting.

Electric Braking: Types of Braking - Braking of D.C and A.C motors, Energy relation and Dynamics of Braking. Rating of Motors: Heating effects - Load conditions and classes of duty, Determination of power rating. Effect of load inertia and load equalization.

UNIT III

D.C motor control: Single-phase controlled rectifier and Chopper circuit arrangement for Continuous armature current operation. Dual converter control, Circulating current and Non - Circulating current modes of operation, Principles of closed loop control for D.C drives.

UNIT IV

Induction Motor Control: Speed control of 3 phase Induction motor with A.C voltage regulators, Voltage sources inverters and Cyclo - converters, Static rotor resistance control, Slip power recovery schemes: Static Krammer drive and Scherbius drive, Variable frequency drives.

UNIT V

Synchronous Motor Control: Self controlled and separately controlled synchronous motors, linear induction motors, Permanent magnet synchronous motor drives and Applications.

Suggested Reading:

1. S.K. Pillai, A First Course in Electrical Drives, New Age International (P) Limited, Publishers, 2000.
2. M.D.Singh and K.B. Khanchandani, Power Electronics, Tata McGraw Hill Publishing Company Ltd., 2000.
3. Bimal. K. Bose, Modern Power Electronics and AC Drives, Pearson Education Asia, 2002.

PC703EE

UTILIZATION OF ELECTRICAL ENERGY

Instruction	:	4 Periods per week
Duration of University Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30 Marks
Credits	:	3

Course Objectives:

- To introduce the students and understand Utilization of electrical energy for various applications like industrial heating, welding etc.,
- To understand the concept of illumination, and know the applications of various lamps to factory lighting, street lighting etc.
- To understand the concept of electrification of traction system.

UNIT I

Industrial Heating: Advantages and methods of electric heating. Description, operation and performance of resistance ovens — Design of elements. Core type, Coreless type furnaces, High frequency eddy current heating, Dielectric heating. Arc furnace. Electric welding, Resistance welding, welding transformer and its rating, various types of Electric arc welding and electric resistance welding.

UNIT II

Schematic Utilization and Connection Diagrams for Motor Control: Two supply sources for 3 phase Induction motors. Direct reversing, remote control operation, and jogging operating of Induction motor. Contactor control circuit. Push button control stations. Over load relays, limit switches, float switches. Interlocking methods for reversing control.

UNIT III

Illumination: Introduction, nature and production of light, Sensitivity of the eye, Units of light. The inverse square law and cosine law, Solid angle, Lighting calculations — Determination of M.S.C.P, Rousseau's construction,

Discharge lamps, Sodium vapour lamps, Mercury vapour lamps — Fluorescent lamp, Starting and power factor corrections, Stroboscopic effects — Neon signs, Application to factory lighting, Street lighting and Flood lighting.

UNIT IV

Electric Traction: System of Electric Traction — Transmission of drive — Systems of track electrification — Traction mechanics — Speed time curves — Tractive effort — Power of Traction motor — Specific energy consumption — Mechanics of train movement— Coefficient of adhesion.

Traction Motors: Desirable characteristics, d.c series motors, a.c series motors 3-phase induction motors, d.c motor series & parallel control, Energy saving.

UNIT V

Train Lighting: Systems of train lighting — Special requirements of train lighting — Methods of obtaining unidirectional polarity — Methods of obtaining constant output — Single battery system — Double battery parallel block system — Principal equipment of double battery system — Coach wiring — Dynamo.

Batteries: Lead acid batteries, SMF batteries, Construction and maintenance, Charging and rating of batteries.

Suggested Reading:

1. Partab H, Art and Science of Utilization of Electric Power, Dhanpat Rai & Sons, 1997.
2. K.B. Raina & S.K. Bhattacharya, Electrical Design, Estimating
3. and Costing, Wiley Eastern Ltd., 1991.
4. Partab H, Modern Electric Traction, Dhanpat Rai & Sons, 2000.
5. B.L.Theraja, A Text Book of Electrical Technology, S.Chand & Company Ltd, Vol —I.

PC704EE

Power Electronic Applications to Power Systems

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

UNIT - I

Facts concepts: Reactive power control in electrical power transmission, principles of conventional reactive power compensators. Introduction to FACTS, flow of power in AC parallel paths, meshed systems, basic types of FACTS controllers, definitions of FACTS controllers, brief description of FACTS controllers.

UNIT - II

Static shunt and series compensators:

Shunt compensation - objectives of shunt compensation, methods of controllable VAR generation, static VAR compensators - SVC, STATCOM, SVC and STATCOM comparison. Series compensation - objectives of series compensation, thyristor switched series capacitors (TCSC), static series synchronous compensator (SSSC), power angle characteristics, and basic operating control schemes.

UNIT -III

Combined compensators: Unified power flow controller (UPFC) - Introduction, operating principle, independent real and reactive power flow controller and control structure. Interline power flow controller (IPFC), Introduction to Active power filtering, Concepts relating to Reactive power compensation and harmonic current compensation using Active power filters.

UNIT IV

HVDC transmission: HVDC Transmission system: Introduction, comparison of AC and DC systems, applications of DC transmission, types of DC links, Layout of HVDC Converter station and various equipments. HVDC Converters, analysis of bridge converters with and without overlap, inverter operation, equivalent circuit representation of rectifier and inverter configurations

UNIT V

Control of HVDC system: Principles of control, desired features of control, converter control characteristics, power reversal, Ignition angle control, current and extinction angle control. Harmonics-introduction, generation, ac filters and dc filters.

Introduction to multi terminal DC systems and applications, comparison of series and parallel MTDC systems.

Suggested Reading:

1. Song, Y.H. and Allan T. Johns, 'Flexible AC Transmission Systems (FACTS)', Institution of Electrical Engineers Press, London, 1999.

2. Hingorani ,L.Gyugyi, 'Concepts and Technology of Flexible AC Transmission System', IEEE Press New York, 2000 ISBN –078033 4588.
3. Padiyar, K.R., 'HVDC transmission systems', Wiley Eastern Ltd., 2010.
4. Mohan Mathur R. and Rajiv K.Varma , 'Thyristor - based FACTS controllers for Electrical transmission systems', IEEE press, Wiley Inter science , 2002.
5. Padiyar K.R., 'FACTS controllers for Transmission and Distribution systems' New Age International Publishers, 1st Edition, 2007.
6. Enrique Acha, Claudio R.Fuerte-Esqivel, Hugo Ambriz-Perez, Cesar Angeles-Camacho 'FACTS –Modeling and simulation in Power Networks' John Wiley & Sons, 2002.

PE701 EE

SMART GRID TECHNOLOGY

(Professional Elective-IV)

UNIT-I

Introduction to Smart Grid: Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions-comparison of Power Grid and Smart Grid-New Technologies for Smart Grid – Advantages – Present development and International policies in Smart Grid, Indian Smart Grid. Key Challenges for Smart Grid. Components and Architecture of Smart Grid-Description.

UNIT-II

DC Distribution and Smart Grid: AC Vs DC sources-Benefits of and drives of DC power delivery systems – Powering equipment and appliances with DC-Data centers and information technology loads equipment and appliances with DC-Data centers and information technology loads – Future neighbourhood- Potential future work and research.

UNIT-III

Smart Grid Communications and Measurement Technology: Communication and Measurement – Monitoring, Phasor Measurement Unit (PMU), Smart Meters, Wide area measurement System (WAMS).

UNIT-IV

Renewable Energy and Storage: Introduction to Renewable Energy Technologies-Micro grids-Storage Technologies-Electric Vehicles and plug-in hybrids-Environmental impact and Climate Change-Economic Issues. Grid integration issues of renewable energy sources.

UNIT-V

Smart Power Grid System Control: Load Frequency Control (LFC) in Micro Grid System – Voltage Control in Micro Grid System, Reactive Power Control in Smart Grid.

TEXT BOOKS

1. Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 2013.
2. A.G. Phadke and J.S. Thorp, "Synchronized Phasor Measurements and their Application", Springer Edition, 2010.
3. Iqbal Hussein, "Electric and Hybrid Vehicle: Design fundamentals", CRC Press, 2003.
4. Gil Masters, Renewable and Efficient Electric Power System, Wiley-IEEE Press, 2004.
5. Fereidoon P. Sioshansi, "Smart Grid: Integrating Renewable, Distributed & Efficient Energy", Academic Press, 2012.
6. Jean Claude Sabonnadiere, Nouredine Hadjsaid, "Smart Grids". Wiley-ISTE, IEEE Press, May 2012.

PE702EE

ELECTRICAL MACHINE DESIGN

(Professional Elective-IV)

Instruction	:	3 Periods per week
Duration of University Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30 Marks
Credits	:	3

Course Objectives:

- To Study the Qualitative & Quantitative analysis of magnetic circuit design, Electrical Circuit Design and Thermal Circuit . Design of Electrical Machine.
- To understand the Design and analysis of different types of windings used for DC/AC machines.
- To understand the Design principles of different rotating machines can be studied.

UNIT I

Electrical Engineering Materials: Insulating materials: Properties of ideal insulating materials. Classification and types of insulating materials, Gaseous, liquid, Solid, fibrous and mineral insulating materials, Plastic, glass and ceramic materials. Conducting Materials: General properties materials, Super conductors. Magnetic

Materials: Classification of magnetic materials, Soft and hard magnetic materials, sheet, cold rolled steel, solid core and powder core materials.

UNIT II

Magnetic Circuit: Basic principles, magnetic circuit calculation flux density in air-gap and tooth. Carter's coefficient, ampere turns for gap and teeth, real and apparent flux density, magnetic leakage, leakage flux from salient poles, field distribution curves, field turns, armature reaction ampere turns. Reluctance of rectangular slots.

UNIT III

Electrical Circuit: AC Single phase, three phase windings. Mesh and concentric winding, Double layer winding.

Thermal Circuit: Types of enclosures, ventilating and cooling methods in Electrical Machines-Losses, Temperature rise time curve and cooling curve. Rating of electrical machines, calculation for quantity of cooling medium.

UNIT-IV

Transformer Design – Main dimensions-output Equations-Core Design-cooling system design. Design principles of rotating machines: output equations and main dimensions, defining of magnetic loading, design of slot field coils, estimation of air gap lengths.

UNIT-V

Computer Aided Design: Introduction, Advantages of digital computers: computer aided design-different approaches: Analysis method, synthesis method, hybrid method, optimization. General procedure for optimization, variable constraints. Computer aided design of 3 phase induction motor. List of symbols used, general design procedure.

Suggested Reading:

1. A.K. Sawhney, A course in Electrical Machines Design, Dhanpat Rai and Sons,1996
2. R.K. Agarwal ,Principles of Electrical Machine Design, ESS Kay Publications , Naisarak, New Delhi,1994
3. V.N.Mittal, Design of Electrical Machines, Standard Publishers and Distributors, New Delhi,1992

PE703 EE

ENERGY MANAGEMENT SYSTEMS AND SCADA

(Professional Elective-IV)

OBJECTIVES:

The course should enable the students to:

- Outline energy management systems and unit commitment and its solution techniques.
- Discuss power generation scheduling with limited energy.
- Describe the architecture, functions and applications of supervisory control and data acquisition (SCADA).
- Apply SCADA in power system automation and communications.

UNIT 1. INTRODUCTION TO ENERGY MANAGEMENT SYSTEMS

Energy management centers: Energy management centers and their functions, architectures, recent developments, characteristics of power generating units and economic dispatch, unit commitment (spinning reserve, thermal, hydro and fuel constraints), solution techniques of unit commitment.

UNIT-II. POWER GENERATION SCHEDULING

Generation scheduling: Generation scheduling with limited energy, energy production cost models, budgeting and planning, practical considerations, interchange evaluation for regional operations, types of interchanges, exchange costing techniques.

UNIT-III INTRODUCTION TO SCADA

Supervisory control and data acquisition: Introduction to supervisory control and data acquisition, SCADA functional requirements and components. SCADA Application: General features, functions and applications, benefits of SCADA, architectures of SCADA, applications of SCADA.

UNIT-IV. CONFIGURATIONS OF SCADA

SCADA and power systems: Configurations of SCADA, RTU (remote terminal units) connections, power systems SCADA and SCADA in power system automation.

UNIT-V. SCADA COMMUNICATION

SCADA and communication: SCADA communication requirements, SCADA communication protocols: past present and future, structure of a SCADA communications protocol.

Suggested Reading:

1. Handschin E, “Energy Management Systems”, Springer Verlag, 1st Edition, 1990.
2. Handschin E, “Real Time Control of Electric Power Systems”, Elsevier, 1st Edition, 1972.
3. John D Mc Donald, “Electric Power Substation Engineering”, CRC press, 1st Edition, 2001.

4. Wood, A J and Wollenberg, B F, "Power Generation Operation and Control", John Wiley and Sons, 2nd Edition 2003.
5. Green, J N Wilson, R, "Control and Automation of Electric Power Distribution Systems", Taylor and Francis, 1st Edition, 2007.
6. Turner, W C, "Energy Management Handbook", Fairmont Pres, 5th Edition, 2004.

OE761 BE

HUMAN FACTOR ENGINEERING & ERGONOMICS

(Open Elective-II)

Instruction	:	3 Periods per week
Duration of University Examination	:	3 Hours
Semester End Examination	:	70 Marks
Sessional	:	30 Marks
Credits	:	3

Objectives

- Provide a broad based introduction to ergonomic principles and their application in the design of work, equipment and the workplace.
- Consideration is given to musculo-skeletal disorders, manual handling, ergonomic aspects of the environment as well as to the social and legal aspects.

Outcomes

Successfully the student will be able to:

- apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace
- conduct ergonomic risk assessments
- develop appropriate control measures for ergonomic risk factors
- describe work-related causes of musculo-skeletal disorders
- design a workplace according to good ergonomic principles
- Assess ergonomic aspects of the working environment and work organization.

UNIT-I: Overview of Ergonomics (20%)

General Principles -Aims, objectives and benefits of ergonomics , Definition and scope of ergonomics and systems of work, The role of the ergonomist, Fitting the job to the person and the person to the job, Human characteristics, capabilities and limitations, Human error, Teamwork and ageing, Interfaces between job, person and environment, Human computer interaction

Biological Ergonomics- Body systems - musculo-skeletal and nervous, Anatomy, static and dynamic anthropometry. Biomechanics . Applying work physiology - body metabolism, work capacity and fatigue, Static and dynamic postures

Psychology-Perception of risk, Motivation and behaviour, Memory, Signal Detection Theory and vigilance, ‘Work 'Stress' - causes, preventative and protective measures, Work organisation - shift working and overtime

Developing an Ergonomics Strategy at Work- Culture of an organisation - commitment and decision-making , ‘Macro-ergonomics' and participatory ergonomic teams , Ergonomics at the design stage , Developing ergonomics, professional ergonomists and competence

UNIT-II: Ergonomics Methods and Techniques (20%)

Work Design -Task analysis and allocation of functions, User trials, Problem solving - scientific method

Ergonomics Risk Assessment- Definitions of hazard and risk, Priorities, Risk evaluation quantity and quality of risk, Assessment systems, Overall ergonomics approach , Control measures monitoring and feedback

Measurements and Information Gathering - Ergonomics standards, Observational techniques , Rating scales, questionnaires and check lists, Use of models and simulation

UNIT-III: Musculo-Skeletal Disorder (20%)

Manual Handling-The nature and causes of manual handling disorders, Risk assessment, Job design and training, Principles of handling and preventative and protective measures

Work Related Upper Limb Disorders (WRULD)- The nature and causes of WRULD/ 'Repetitive Strain Injuries'/ Cumulative Disorders, Risk assessment, Principles of control, preventive and protective measures

UNIT-IV: Workplace, Job and Product Design (20%)

Workplace Layout and Equipment Design- Principles of workstation and system design, Space and workstation design principles , Risks to health: Musculoskeletal problems, Visual fatigue, Mental stress, Requirements for eye tests, Design considerations for Visual Display Unit (VDU) Stations: Ergonomic factors, Work stations, Design of work and practice, Carrying out assessments of risk at VDU workstations

Controls, Displays and Information-Visual, auditory and other displays, Quantitative and qualitative information, Compatibility and population stereotypes, Warnings, signs and labels, Sources and selection of data , Principles of software ergonomics

UNIT-V: Relevant Physical Factors of the Work Environment (10%) & Standards and Social Aspects (10%)

Lighting - Visual acuity and colour vision, Lighting levels, contrast and glare, Reflections and flicker fusion

Noise - Noise induced hearing loss, Distraction, annoyance and emergency signals

Thermal Environment- Body temperature regulation and acclimatisation ,Subjective assessments - thermal comfort and discomfort

Other Considerations- Smell, taste and tactile senses, Vibration - effects and subjective assessment

Clothing and Protective Equipment- Objective and subjective effects, Risk perception, and wearability , Design, style and fit

Standards - ISO standards, Sources of other standards

Selection and Training- Training Needs Analysis , Testing and interview techniques

Instruction and Supervision-Health information, legal requirements, Supervision and records, Measuring health and illness

Suggested Reading:

1. Introduction to Human factors and Ergonomics, 4th edition by Gariel Salvendy, John & Willey & Son's.
2. Introduction to Human Factors and Ergonomics, 4th Edition by Robert Bridger, CRC Press.
3. An Introduction to Human factors Engineering by 2nd Edition, Christopher D. Wickens, Sallie E. Gardon, Yili Liv, PHI series.
4. Stephen Konz and Steve Johnson 2007 Work Design: Occupational Ergonomics 7th Edition Holcomb Hathway.
5. Dul & Weerdmeester 2003 Ergonomics for Beginners Taylor & Francis.
6. R.S.Bridger 2003 Introduction to Ergonomics Taylor & Francis

OE761 BE

BASIC MEDICAL EQUIPMENT

(Open Elective-II)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
Semester End Examination	70 Marks
Sessionals	30 Marks
Credits	3

OBJECTIVES:

- State the Physiological reasons for using a particular piece of Biomedical Equipment.
- Describe the operating principles of a wide range of biomedical equipment.
- To familiarize the latest technologies of modern medicine
- To make learners able to use new and updated diagnostic methodologies
- To make learners capable enough of adopting the methods of recovery and improving health with a service approach

OUTCOMES:

- Perform tests to assess the performance and safety of various Equipments.
- Learn the maintenance of biomedical equipment.

UNIT-I

Medical Monitoring and Recording: Patient monitoring: System concepts, bedside monitoring systems, central monitors, heart rate and pulse rate measurement. Temperature measurement Blood pressure measurement: Direct and indirect methods. Respiration rate measurement: Impedance pneumograph, Apnoea detectors. Ambulatory monitoring: Arrhythmia monitor, data recording, replay and analysis, Telemetry.

UNIT-II

Physiotherapy and Electrotherapy Equipment: Diathermy machines: Short wave diathermy, Microwave diathermy and ultrasonic diathermy Electro diagnostic/Therapeutic apparatus: Nerve muscle stimulator, Functional electrical stimulator etc.

UNIT-III

Medical Imaging Equipment: X-Ray machines: Properties and production of X-Rays, X-ray machine, Image Intensifier. X-ray computed tomography: basic principle and construction of the components. Ultrasonic Imaging: Physics of ultrasonic waves, medical ultrasound, basic pulse echo apparatus. Magnetic Resonance Imaging: Principle, Image reconstruction techniques, Basic NMR components, Biological effects, Merits.

UNIT-IV

Critical care Equipment: Ventilators: Mechanics of respiration, artificial ventilators, Positive pressure ventilator, Types and classification of ventilators. Drug delivery system: Infusion pumps, basic components, implantable infusion system, closed loop control in infusion pump. Cardiac Defibrillators: Need for defibrillators, DC defibrillator, Implantable defibrillators, Defibrillator analyzer.

UNIT-V

Therapeutic Equipment: Cardiac pacemakers: Need for cardiac pacemakers, External and implantable pacemakers, types. Dialysis Machine: Function of kidney, artificial kidney, Dialyzers, Membranes, Hemodialysis machine. Lithotripters: The stone diseases problem, Modern Lithotripter systems, extra corporeal shockwave therapy.

Suggested Readings:

- R.S.Khandpur, Hand Book of Biomedical Instrumentation, Tata McGrawHill, Second Edition, 2014.
- John G.Webster, Medical Instrumentation Application and design, Wiley India Edition, 2009.

OE 701 CE

OPTIMIZATION TECHNIQUES

(Open Elective - II)

Instruction	: 3 periods per week
Duration of Semester End Examination	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

- To understand the basic concepts of operations research.
- To study about the linear programming and non linear programming.
- To gain knowledge on various gradient search methods.

Course Outcomes:

- Ability to solve problems of L.P. by graphical and Simplex methods
- Ability to formulate Operation Research formulation
- Ability to solve problems of Integer Programming

UNIT-I

Introduction: Definitions, Characteristics, Objective function, Classification of optimization problems, Engineering applications and limitations. Construction of L.P. Models, Slack and surplus variables, Standard form, Canonical form and matrix form of LP Problems.

Unit – II

Linear Programming: Definitions and Formulation of the LPP, Graphical methods, numerical problems by graphical method, Simplex algorithm, Numerical problems using Simplex method.

Unit – III

Artificial Variables, solution by the Big-M method, Two-Phase method, special cases in Simplex method viz. Degeneracy, alternate optima, unbound solutions and infeasible solutions and numerical problems. Duality principle, Dual problems and numerical problems.

UNIT-IV

Non-Linear Programming: Introduction, local and global optima, concave and convex functions, Kuhn-Tucker conditions, graphical solutions. Direct search method, Gradient method, Quadratic programming problems.

UNIT-V

Integer Linear Programming : Importance of Integer Linear Programming, Necessity, Definitions, Gomory's cutting plane method, Branch and bound method, zero-one programming, numerical problems.

Suggested Reading

1. Hillier, F. S. and Lieberman, G. J. (2009). "Introduction to Operations Research." Ninth Edition, McGraw-Hill, Holden-Day.
2. Taha, H.A. (2008). "Operations Research, Pearson Education India." New Delhi, India
3. Anand Sharma. (2014). "Quantitative Techniques for Decision Making."Himalaya Publishers.
4. Srinivasa Raju, K. and Nagesh Kumar, D. (2014). "Multicriterion Analysis in Engineering and Management." Prentice Hall of India (PHI) Learning Pvt. Ltd, New Delhi.
5. Rao, S.S. (2009). "Engineering Optimization: Theory and Practice." John Wiley.
6. Sharma J.K. (2013). "Operation Research: Theory and Applications." Fifth Edition, Macmillan Publishers, New Delhi, India.

***OE 701 CS**

DATABASE SYSTEMS

(Open Elective-II)

Instruction	: 4 periods per week
Duration of Semester End Examination	: 3 hours
University Examination	: 70 marks
Sessional	: 30 marks
Credits	: 3

Course Objectives:

- To introduce three schema architecture and DBMS functional components
- To learn formal and commercial query languages of RDBMS
- To understand the principles of ER modeling and theory of normalization
- To study different file organization and indexing techniques
- To familiarize theory of serializablity and implementation of concurrency control, and recovery

Course Outcomes :

Student will be able to:

- Understand the mathematical foundations on which RDBMS are built
- Model a set of requirements using the Extended Entity Relationship Model (EER), transform an EER model into a relational model ,and refine the relational model using theory of Normalization
- Develop Database application using SQL and Embedded SQL
- Use the knowledge of file organization and indexing to improve database application performance
- Understand the working of concurrency control and recovery mechanisms in RDBMS

UNIT – I

Introduction: Database System Applications, Purpose of Database Systems, View of Values, Nested Sub-queries, Complex Queries, Views, Modification of the Database, Joined Relations Data, Database Languages, Relational Databases, Database Design, Object–based and Semi-structured Databases, Data Storage and Querying, Transaction Management, Data Mining and Analysis, Database Architecture, Database Users and Administrators.

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams, Entity – Relationship Design Issues, Weak Entity Sets, Extended E-R Features, Database Design for Banking Enterprise, Reduction to Relational Schemas, Other Aspects of Database Design

UNIT – II

Relational Model: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational – Algebra Operations, Extended Relational - Algebra Operations, Null Values, Modification of the Databases.

Structured Query Language: Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null

UNIT – III

Advanced SQL: SQL Data Types and Schemas, Integrity Constraints, Authorization, Embedded SQL, Dynamic SQL, Functions and Procedural Constructs, Recursive Queries, Advanced SQL Features. Relational Database Design: Features of Good Relational Design, Atomic Domains and First Normal Form, Functional-Dependency Theory, Decomposition using Functional Dependencies.

UNIT – IV

Indexing and Hashing: Basic Concepts, Ordered Indices, B^+-tree Index Files, B-tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

Index Definition in SQL Transactions: Transaction Concepts, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability

UNIT – V

Concurrency Control: Lock-based Protocols, Timestamp-based Protocols, Validation-based Protocols, Multiple Granularity, Multi-version Schemes, Deadlock Handling, Insert and Delete Operations, Weak Levels of Consistency, Concurrency of Index Structures.

Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques, Remote Backup Systems

Suggested Readings:

- Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGraw-Hill International Edition, 6th Edition, 2010
- Ramakrishnan, Gehrke, Database Management Systems, McGraw-Hill International Edition, 3rd Edition, 2003
- Elmasri, Navathe, Somayajulu, Fundamentals of Database Systems, Pearson Education, 4th Edition, 2004

*OE 702 CS

INFORMATION SECURITY

(Open Elective-II)

Instruction	: 4 periods per week
Duration of Semester End Examination	: 3 hours
University Examination	: 70 marks
Sessional	: 30 marks
Credits	: 3

Course Objectives:

- To learn legal and technical issues in building secure information systems
- To provide an understanding of network security
- To expose the students to security standards and practices

Course Outcomes:

On completion of this course student should be able to:

- Describe the steps in Security Systems development life cycle(SecSDLC)
- Understand the common threats and attack to information systems
- Understand the legal and ethical issues of information technology
- Identify security needs using risk management and choose the appropriate risk control strategy based on business needs
- Use the basic knowledge of security frameworks in preparing security blue print for the organization
- Usage of reactive solutions, network perimeter solution tools such as firewalls, host solutions such as antivirus software and Intrusion Detection techniques and knowledge of ethical hacking tools
- Use ethical hacking tools to study attack patterns and cryptography and secure communication protocols
- Understand the technical and non-technical aspects of security project implementation and accreditation

UNIT-I

Introduction: History, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.

Need for Security: Business Needs, Threats, Attacks, and Secure Software Development

UNIT-II

Legal, Ethical and Professional Issues: Law and ethics in Information Security, Relevant U.S. Laws, International Laws and Legal Bodies, Ethics and Information Security.

Risk Management: Overview, Risk Identification, Risk Assessment, Risk Control Strategies, Selecting a Risk Control Strategy, Quantitative versus Qualitative Risk Control Practices, Risk Management discussion Points, Recommended Risk Control Practices.

UNIT-III

Planning for Security: Security policy, Standards and Practices, Security Blue Print, Security Education, Continuity strategies.

Security Technology: Firewalls and VPNs: Physical Design, Firewalls, Protecting Remote connections.

UNIT-IV

Security Technology: Intrusion Detection, Access Control, and other Security Tools: Intrusion Detection and Prevention Systems-Scanning, and Analysis Tools- Access Control Devices.

Cryptography: Foundations of Cryptology, Cipher methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communications, Attacks on Cryptosystems

UNIT-V

Implementing Information Security: Information security project management, Technical topics of implementation, Non Technical Aspects of implementation, Security Certification and Accreditation.

Security and Personnel: Positioning and staffing security function, Employment Policies and Practices, and Internal control Strategies.

Information Security Maintenance: Security management models, Maintenance model, and Digital Forensics.

Suggested Reading:

1. Michael E Whitman and Herbert J Mattord, "*Principles of Information Security*", Cengage Learning, 2011.
2. Thomas R Peltier, Justin Peltier, John Blackley, "*Information Security Fundamentals*", Auerbach Publications, 2010.
3. Detmar W Straub, Seymour Goodman, Richard L Baskerville, "*Information Security, Policy, Processes, and Practices",* PHI, 2008.
4. Mark Merkow and Jim Breithaupt *" Information Security Principle and Practices"*, Pearson Education, 2007

OE 701 EC

PRINCIPLES OF ELECTRONIC COMMUNICATIONS

(Open Elective-II)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Course Objectives:

- Provide an introduction to fundamental concepts in the understanding of communications systems.
- Provide an introduction to network model and some of the network layers including physical layer, data link layer, network layer and transport layer.
- Provide an introduction to the evolution of wireless systems and current wireless technologies.

Course Outcomes:

Student will be Able to

- Understand the working of analog and digital communication systems
- Understand the OSI network model and the working of data transmission
- Understand the evolution of communication technologies from traditional telephony systems to modern wireless communication systems.

UNIT- I

Introduction to Communication Systems: Electromagnetic Frequency Spectrum, Signal and its representation, Elements of Electronic Communications System, Types of Communication Channels, Signal Transmission Concepts-Baseband transmission and Broadband transmission, Communication parameters-Transmitted power, Channel bandwidth and Noise, Need for modulation Signal Radiation and Propagation-Principle of electromagnetic radiation, Types of Antennas, Antenna Parameters and Mechanisms of Propagation.

UNIT- II

Analog and Digital Communications: Amplitude modulation and demodulation, FM modulation and demodulation, Digital converters, Digital modulation schemes – ASK, FSK, PSK, QPSK, Digital demodulation.

UNIT- III

Data Communication and Networking: Network Models, OSI Model, Data Link Layer – Media Access control, Ethernet, Network Layer – Internet Protocol (IPv4/IPv6), Transport Layer – TCP, UDP.

UNIT- IV

Telecommunication Systems: Telephones, Telephone system, Paging systems, Internet Telephony.

Optical Communications: Optical Principles, Optical Communication Systems, Fiber – Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT- V

Wireless Communications: Evolution of Wireless Systems: AMPS, GSM, CDMA, WCDMA, OFDM. Current Wireless Technologies: Wireless LAN, Bluetooth, PAN and ZigBee, Infrared wireless, RFID communication, UWB, Wireless mesh networks, Vehicular adhoc networks.

Suggested Readings:

1. *Principles of Electronic Communication Systems*, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. *Data Communications and Networking*, Behrouz A. Forouzan, 5e TMH, 2012.
3. Kennady, Davis, *Electronic Communications systems*, 4e, TMH, 1999.

PE 702 EC

FUNDAMENTALS OF IOT

(Open Elective-II)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Course Objectives:

- Discuss fundamentals of IoT and its applications and requisite infrastructure
- Describe Internet principles and communication technologies relevant to IoT
- Discuss hardware and software aspects of designing an IoT system
- Describe concepts of cloud computing and Data Analytics
- Discuss business models and manufacturing strategies of IoT products

Course Outcomes:

Student will be able to

- Understand the various applications of IoT and other enabling technologies.
- Comprehend various protocols and communication technologies used in IoT
- Design simple IoT systems with requisite hardware and C programming software
- Understand the relevance of cloud computing and data analytics to IoT
- Comprehend the business model of IoT from developing a prototype to launching a product.

UNIT- I

Introduction to Internet of Things: IOT vision, Strategic research and innnovation directions, Iot Applications, Related future technologies, Infrastructure, Networks and communications, Processes, Data Management, Security, Device level energy issues.

UNIT- II

Internet Principles and Communication Technology: Internet Communications: An Overview – IP, TCP, IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addressees, TCP and UDP Ports, Application Layer Protocols – HTTP, HTTPS, Cost Vs Ease of Production, Prototypes and Production, Open Source Vs Closed Source.

UNIT- III

Prototyping and Programming for IoT: Prototyping Embedded Devices – Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping, Hardware platforms – Arduino, Raspberry Pi. Prototyping the physical design – Laser Cutting, 3D printing, CNC Milling.

Techniques for writing embedded C code: Integer data types in C, Manipulating bits - AND,OR,XOR,NOT, Reading and writing from I/ O ports. Simple Embedded C programs for LED Blinking, Control of motor using switch and temperature sensor for arduino board.

UNIT- IV

Cloud computing and Data analytics: Introduction to Cloud storage models -SAAS, PAAS, IAAS. Communication APIs, Amazon webservices for IoT, Skynet IoT Messaging Platform. Introduction to Data Analytics for IoT - Apache hadoop- Map reduce job execution workflow.

UNIT- V

IoT Product Manufacturing - From Prototype to Reality: Business model for IoT product manufacturing, Business models canvas, Funding an IoT Startup, Mass manufacturing - designing kits, designing PCB,3D printing, certification, Scaling up software, Ethical issues in IoT- Privacy, Control, Environment, solutions to ethical issues.

Suggested Readings:

1. *Internet of Things* - Converging Technologies for smart environments and Integrated ecosystems, River Publishers.
2. *Designing the Internet of Things* , Adrian McEwen, Hakim Cassimally. Wiley India Publishers
3. *Fundamentals of embedded software***:** where C meets assembly by Daneil W lewies, Pearson.
4. *Internet of things* -A hands on Approach, Arshdeep Bahga, Universities press.

OE701EE

NON CONVENTIONAL ENERGY SOURCES

(Open Elective-II)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

UNIT-I

Review of Conventional and Non-Conventional energy sources - Need for non-conventional energy sources Types of Non- conventional energy sources - Fuel Cells - Principle of operation with special reference to H2 °2 Cell - Classification and Block diagram of fuel cell systems - Ion exchange membrane cell - Molten carbonate cells - Solid oxide electrolyte cells - Regenerative system- Regenerative Fuel Cell - Advantages and disadvantages of Fuel Cells- Polarization - Conversion efficiency and Applications of Fuel Cells.

UNIT-II

Solar energy - Solar radiation and its measurements - Solar Energy collectors -Solar Energy storage systems - Solar Pond - Application of Solar Pond - Applications of solar energy.

UNIT-III

Wind energy- Principles of wind energy conversion systems - Nature of wind - Power in the Wind-Basic components of WECS -Classification of WECS -Site selection considerations - Advantages and disadvantages of WECS -Wind energy collectors -Wind electric generating and control systems - Applications of Wind energy -Environmental aspects.

UNIT- IV

Energy from the Oceans - Ocean Thermal Electric Conversion (OTEC) methods - Principles of tidal power generation -Advantages and limitations of tidal power generation -Ocean waves - Wave energy conversion devices -Advantages and disadvantages of wave energy - Geo-thermal Energy - Types of Geo-thermal Energy Systems - Applications of Geo-thermal Energy.

UNIT-V

Energy from Biomass - Biomass conversion technologies / processes - Photosynthesis - Photosynthetic efficiency - Biogas generation - Selection of site for Biogas plant - Classification of Biogas plants - Details of commonly used Biogas plants in India - Advantages and disadvantages of Biogas generation -Thermal gasification of biomass - Biomass gasifies.

Suggested Reading:

1. Rai G.D, *Non-Conventional Sources of Energy,* Khandala Publishers, New Delhi, 1999.
2. M.M.El-Wakil, *Power Plant Technology.* McGraw Hill, 1984.

OE701ME

STARTUP ENTREPRENEURSHIP

(Open Elective-II)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Course Objectives:

- To motivate students to take up entrepreneurship in future
- To learn nuances of starting an enterprise by creative thinking and shape ideas into reality.
- To understand action driven business plan and learn to prepare project budget.

Course Outcomes:

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

- Think creatively and and transform ideas into reality.
- Differentiate market transforming strategy.
- Create a complete business plan and workout the budget plan.

Student will be able to

UNIT-I

Creativity & Discovery: Definition of Creativity, self test creativity, discovery and delivery skills, The imagination threshold, Building creativity ladder, Collection of wild ideas, Bench marking the ideas, Innovative to borrow or adopt, choosing the best of many ideas, management of tradeoff between discovery and delivery, Sharpening observation skills, reinventing self, Inspire and aspire through success stories

UNIT-II

From Idea to Startup: Introduction to think ahead backward, Validation of ideas using cost and strategy, visualizing the business through value profile, activity mapping, Risks as opportunities, building your own road map

UNIT-III

Innovation career lessons: Growing & Sharing Knowledge, The Role of Failure In Achieving Success, Creating vision, Strategy, Action & Resistance: Differentiated Market Transforming Strategy; Dare to Take Action; Fighting Resistance; All About the startup Ecosystem; Building a Team; Keeping it Simple and Working Hard.

UNIT-IV

Action driven business plan: Creating a completed non-business plan (a series of actions each of which moves your idea toward implementation), including a list of the activities to be undertaken, with degrees of importance (scale of 1 to 3, where 1 is 'most important'). A revision of the original product or service idea, in light of information gathered in the process, beginning to design the business or organization that will successfully implement your creative idea. Preparing an activity map.

UNIT-V

Startup financing cycle: Preparing an initial cash flow statement, showing money flowing out (operations; capital) and flowing in. Estimate your capital needs realistically. Prepare a bootstrapping option (self financing). Prepare a risk map. Prepare a business plan comprising five sections: The Need; The Product; Unique Features; The Market; Future Developments. Include a Gantt chart (project plan – detailed activities and starting and ending dates); and a project budget.

Suggested Readings:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project – Planning, Analysis, Selection, Implementation and Review", Tata McGraw-Hill Publishing Company Ltd., 1995.
3. B. Badhai, "Entrepreneurship for Engineers", Dhanpath Rai & Co., Delhi, 2001.
4. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster, 2002.
5. Robert D. Hisrich and Michael P.Peters, "Entrepreneurship", Tata McGRaw Hill Edition, 2002.

OE701ME

FINITE ELEMENT METHODS

(Open Elective-II)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Course Objectives:

- To understand the theory and application of the finite element method for analyzing structural systems.
- To learn Approximation theory for structural problems as the basis for finite element methods
- To learn formulations for a variety of elements in one, two, and three dimensions. Implementations of element formulations will be examined using Matlab.
- To understand modeling and analysis of structures using planar, solid, and plate elements

Course Outcomes:

Student will be able to

- Understands the concept of Finite Element Method and realize its limitations.
- Able to formulate 1D, 2D and 3D element and distinguish between linear and higher order elements.
- Applying 1D , 2D and 3D elements to solve different static and dynamic problems.

UNIT-I

Introduction to Finite Element Method, solution method using FEM, descretisation, Boundary conditions, load application, types of elements comparison, Stress and Equilibrium, Boundary conditions. Strain-Displacement relations. Stress-strain relations.

One Dimensionla problems: Finite element modeling, coordinates and shape functions.

Potential Energy approach: Assembly of Gloabal stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions. Quadratic shape functions.

UNIT-II

Analysis of trusses and frames: Element stiffness matrix for a truss member. Analysis of plane truss with number of unknowns not exceeding two at each node. Analysis of frames with two translations and a rotational degree of freedom at each node.

Analysis of Beams: Element stiffness matrix for two nodded, two degrees of freedom per node beam element.

UNIT-III

Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions.

Finite element modeling of Axisymmetirc solids subjected to Axisymmetric loading with triangular elements.

UNIT-IV

Two dimensional four nodded isoprarametric elements and numerical integration.

Steady state heat transfer analysis: Ond dimensional analysis of a find and two dimensional analysis of thin palate. Analysis of uniform shaft subjected to torsion.

UNIT-V

Dynamic Analysis: Formulation of finite element mode, element matrices, evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

Time dependent field problems: Application to one dimensional heat flow in a rod. Finite element formation to three dimensional problems in stress analysis. Types of elements used.

Convergence requirements and geometric isotropy. Local, natural and global coordinates. Introduction to Finite Element Analysis Software.

Suggested Readings:

1. Tirupathi R. Chandraputla and Ashok, D. Belgundu" Introduction to Finite Elements in Engineering", pearson Education, 2002, 3rd Edition.
2. Rao S.S., "The Finite Element Methods in Engineering", pergamon Press, 1989.
3. Segerlind, L.J. "Applied Finite Element Analysis", Wiley Publication, 1984.
4. Reddy J.N., "An Introduction to Finite Element Method", McGraw-Hill Company, 1984.

MC951SP

YOGA PRACTICE

Instruction	:	3 Hours
CIE	:	50 Marks
Credits	:	---

Objectives:

- Enhances body flexibility
- Achieves mental balance
- Elevates Mind and Body co-ordination
- Precise time management
- Improves positive thinking at the expense of negative thinking

Outcomes:

- Students will become more focused towards becoming excellent citizens with more and more discipline in their day-to-day life.
- An all-round development-physical, mental and spiritual health-takes place.
- Self-discipline and discipline with respect society enormouly increases.
- University environment becomes more peaceful and harmonious.

UNIT-I

Introduction

Yoga definition-Health definition from WHO - Yoga versus Health - Basis of Yoga - yoga is beyond science- Zist of 18 chapters of Bhagavadgita - 4 types of yoga: Karma, Bhakti, Gnyana and Raja yoga – Internal and External yoga - Elements of Ashtanga yoga (Yama, Niyama, Asana, Pranayama, Prathyahara, Dharana, Dhyana and Samadhi) - Pancha koshas and their purification through Asana, Pranayama and Dhyana.

UNIT-II

Suryanamaskaras (Sun Salutations)

Definition of sun salutations - 7 chakras (Mooladhaar, Swadhishtaan, Manipura, Anahata, Vishuddhi, Agnya and Sahasrar) - Vaious manthras (Om Mitraya, Om Ravaye, Om Suryaya, Om Bhanave, Om Marichaye, Om Khagaye, Om Pushne, Om Hiranya Garbhaye, Om Adhityaya, Om Savitre, Om Arkhaya, and Om Bhaskaraya) and their meaning while performing sun salutations - Physiology - 7 systems of human anatomy - Significance of performing sun salutations.

UNIT-III

Asanas (Postures)

Pathanjali's definition of asana - Sthiram Sukham Asanam - 3rd limb of Ashtanga yoga - Loosening or warming up exercises - Sequence of perform in asanas (Standing, Sitting, Prone, Supine and Inverted) - Nomenclature of asanas (animals, trees, rishis etc) - Asanas versus Chakras - Asanas versus systems - Asanas versus physical health -Activation of Annamaya kosha.

UNIT-IV

Pranayama (Breathing Techniques)

Definition of Pranayama as per Shankaracharya - 4th limb of Ashtanga yoga - Various techniques of breathing - Pranayama techniques versus seasons - Bandhas and their significance in Pranayama - Mudras and their significance in Pranayama - Restrictions of applying bandhas with reference to health disorders - Pranayama versus concentration - Pranayama is the bridge between mind and body - Pranayam versus mental health - Activation of Pranamaya kosha through Pranayama.

UNIT-V

Dhyana (Meditation)

Definition of meditation - 7th limb of Ashtanga yoga - Types of mind (Conscious and Sub-Conscious) - various types of dhyana. Meditation versus spiritual health - Dharana and Dhyana - Extention of Dhyana to Samadhi - Dhyana and mental stress - Activation of Manomaya kosha through dhyana - Silencing the mind.

Suggested Reading:

1. Light on Yoga by BKS lyengar
2. Yoga education for children Vol-1 by Swami Satyananda Saraswati
3. Light on Pranayama by BKS lyengar
4. Asana Pranayama Mudra and Bandha by Swami Satyananda Saraswati
5. Hatha Yoga Pradipika by Swami Mukhtibodhananda
6. Yoga education for children Vol-11 by Swami Niranjanananda Saraswati
7. Dynamics of yoga by Swami Satyananda Saraswati

MC952SP

NATIONAL SERVICE SCHEME (NSS)

Instruction	:	3 Hours
CIE	:	50Marks
Credits	:	------

Objectives:

1. To help in Character Moulding of students for the benefit of society
2. To create awareness among students on various career options in different fields
3. To remould the students behaviour with assertive skills and positive attitudes
4. To aid students in developing skills like communication, personality, writing and soft skills
5. To educate students towards importance of national integration, participating in electoral process etc by making them to participate in observing important days.

List of Activities:

1. Orientation programme about the role of NSS in societal development
2. Swachh Bharath Programme
3. Guest lecture's from eminent personalities on personality development
4. Plantation of saplings/Haritha Haram Programme
5. Blood Donation / Blood Grouping Camp
6. Imparting computer education to school children
7. Creating Awareness among students on the importance of Digital transactions
8. Stress management techniques
9. Health Checkup Activities
10. Observation of Important days like voters day, World Water Day etc.
11. Road Safety Awareness Programs
12. Energy Conservation Activities
13. Conducting Programme's on effective communication skills
14. Awareness programme's on national integration
15. Orientation on Improving Entrepreneurial Skills
16. Developing Effective Leadership skills
17. Job opportunity awareness programs in various defence, public sector undertakings
18. Skill Development Programmes
19. Creating awareness among students on the Importance of Yoga and other physical activities

20. Creating awareness among students on various government sponsored social welfare schemes for the people.

Note: *At least Ten Activities should be conducted in the Semester***.** Each event conducted under swachh barath, Plantation and important days like voters day, world water day may be treated as a separate activity.

Evaluation Process:

Total Marks 50

i) 50 marks for internal exam (continuous evaluation)

a) 18 marks for viva

b) 32 marks for activities and exam

MC9535SP

SPORTS

Instruction	:	3 Hours
CIE	:	50 Marks

Objectives:

1. To develop an understanding of the importance of sport in the pursuit of a healthy and active lifestyle at the College and beyond.
2. To develop an appreciation of the concepts of fair play, honest competition and good sportsmanship.
3. To develop leadership skills and foster qualities of co-operation, tolerance, consideration, trust and responsibility when faced with group and team problem-solving tasks.
4. To develop the capacity to maintain interest in a sport or sports and to persevere in order to achieve success.
5. To prepare each student to be able to participate fully in the competitive, recreational and leisure opportunities offered outside the school environment.

Outcomes:

1. Students' sports activities are an essential aspect of university education, one of the most efficient means to develop one's character and personal qualities, promote the fair game principles, and form an active life position.
2. Over the past year, sports have become much more popular among our students. Let us remember the most memorable events related to sports and physical training.
3. Special attention was paid to team sports. Our male and female games and sports have achieved remarkable progress at a number of competitions.
4. Our teams in the main sports took part in regional and national competitions. Special thanks to our team in track and field athletics, which has been revitalized this year at ICT and which has won Javelin competition.
5. Staff of our faculties and students of Sports, Physical Development, & Healthy Lifestyle of Faculty congratulates everyone on the upcoming New Year and wishes you robust health and new victories in whatever you conceive.

I. Requirements:

i) Track Paint (students should bring)

ii) Shoes

iii) Volley Ball, Foot Ball and Badminton (Shuttle)

iv) Ground, Court, indoor stadium and swimming pool

II. Evaluation Process:

Total Marks 50

i) 50 marks for internal exam (continuous evaluation)

a) 18 marks for viva

b) 32 marks for sports & fitness

PC751EE

ELECTRICAL SIMULATION LAB

Instruction	:	2 Periods per week
Duration of University Examination	:	2 Hours
SEE	:	50 Marks
CIE	:	25 Marks
Credits	:	1

Simulation experiments should be conducted in the following areas using MATLAB / Simulink (with DSP Tool Box, Control System Tool Box & Power System Tool Box) PSpice /PSCAD / SABER / EDSA/ MOTORPRO I CASPOC I PSSE.

1. Verification of Network theorems
    a. Thevinin's theorem
    b. Superposition theorem
    c. Maximum power transfer theorem.
2. Transient responses of Series RLC, RL and RC circuits with Sine and Step inputs.
3. Series and Parallel resonance.
4. Bode plot, Root-Locus plot and Nyquist plot.
5. Transfer function analysis (i) Time response for Step input (ii) Frequency response for Sinusoidal input.
6. Design of Lag, Lead and Lag - Lead compensators.
7. Load flow studies.
8. Fault analysis.
9. Transient stability studies.
10. Generation of Basic signals using DSP.
11. Calculation of DFT using different methods.
12. Design of filters (Low pass filter).
13. Chopper fed dc motor drives.
14. VSI /CSI Fed induction motors drives. Doubly fed Induction motor, PWM.
15. Phase Control I Chopper control on DC motor Drives.
16. Control of BLDC motor.

Note: At least ten experiments should be conducted.

PC752EE

MICROPROCESSOR AND MICROCONTROLLERS LAB

Instruction	:	2 Periods per week
Duration of University Examination	:	2 Hours
University Examination	:	50 Marks
Sessional	:	25 Marks
Credits	:	1

List of Experiments:

For 8086:

1. Programs for signed/unsigned multiplication and division.
2. Programs for finding average of N-16 bit numbers.
3. Programs for finding largest number in array.
4. Programs for code conversion like BCD numbers into 7- Segment.
5. Programs for computing factorial of appositive integer number.
6. 8279 - Keyboard display: write a small program to display a string of characters.
7. 8255 - PPI: Write ALP to generate triangular wave using DAC.
8. 8253 - Timer/counter: Application of different modes.
9. 8251-USART: Write a program in ALP to establish communication between two Processors.
10. Traffic signal controller.

For 8051:

1. Data transfer – block move, exchange, sorting, finding largest element in array.
2. Arithmetic instructions: multi byte operations.
3. Boolean & logical instructions (Bit manipulations).
4. Programs to generate delay, programs using serial port and on chip timer/counter.
5. Use of JUMP and CALL instructions.
6. Square wave generation using timers.
7. Interfacing of keyboard and 7-segment display module.
8. ADC interfacing for temperature monitoring.
9. DAC interfacing for generation of sinusoidal wave.
10. Stepper motor control (clock wise, anticlockwise and in precise angles).

Note: At least ten experiments should be conducted.

PW753EE

POWER SYSTEMS LAB

Instruction	:	2 Periods per week
Duration of University Examination	:	3 Hours
SEE	:	50 Marks
CIE	:	25 Marks
Credits	:	1

List of Experiments:

1. **Performance characteristics** of 3-phase transmission line model
2. **Deter**mination of A B C D parameters of 3-phase transmission line model .
3. **ID**MT Characteristics o an over current (Electromagnetic) Relay.
4. **Differ**ential Protection of 1-phase transformer.
5. **Deter**mination of +ve, -ve, zero sequence impedance of 3-phase transformer.
6. **Determinati**on of +ve, -ve, zero sequence impedance of 3-phase alternator.
7. **Tra**nsient stability analysis using MATLAB Simulink
8. **Fault a**nalysis on an un-loaded 3-phase alternator.
9. Load Frequency control of a single Area system using MATLAB Simulink
10. Load Frequency control of two area system using MATLAB Simulink
11. .Economic load dispach using power world simulator/software
12. Fault analysis using PSCAD
13. Operating Characteristics of Directional Over Current Relay
14. Characteristics of different relays using relay protection test set.

Note: At least ten experiments should be conducted.

PW761EE

PROJECT WORK-I

Instruction	2 Periods per week
Sessional	50 marks
Credits	2

Course Objectives:

To enhance practical and professional skills.

To familiarize tools and techniques of systematic Literature survey and documentation

To expose the students to industry practices and team work.

To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes:

demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to real-world problems

evaluate different solutions based on economic and technical feasibility

effectively plan a project and confidently perform all aspects of project management

Demonstrate effective written and oral communication skills

The department can initiate the project allotment procedure at the end of VI semester and finalize it in the first two weeks of VII semester.

The department will appoint a project coordinator who will coordinate the following:

Collection of project topics/ descriptions from faculty members (Problems can also be invited from the industries)

Grouping of students (max 3 in a group)

Allotment of project guides

The aim of project work is to develop solutions to realistic problems applying the knowledge and skills obtained in different courses , new technologies and current industry practices. This requires students to understand current problems in their domain and methodologies to solve these problems. To get awareness on current problems and solution techniques, the first 4 weeks of VII semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R&D institutions. After completion of these seminars each group has to formalize the project proposal based on their own ideas or as suggested by the project guide.

Seminar schedule will be prepared by the coordinator for all the students from the 5th week to the last week of the semester which should be strictly adhered to.

Each group will be required to:

Submit a one page synopsis before the seminar for display on notice board.

Give a 30 minutes presentation followed by 10 minutes discussion.

Submit a technical write-up on the talk.

At least two teachers will be associated with the Project Seminar to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

The seminar presentation should include the following components of the project:

*Problem definition and specification

*Literature survey

*Broad knowledge of available techniques to solve a particular problem.

*Planning of the work, preparation of bar (activity) charts

*Presentation- oral and written.

SCHEME OF INSTRUCTION & EXAMINATION
B.E. (EEE) VIII Semester

S. No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P	Contact Hrs/wk	CIE	SEE	
1.	PE-V	Professional Elective - V	3	-	-	3	30	70	3
2.	OE-III	Open Elective-III	3	-	-	3	30	70	3
3.	MC901EG	Gender Sensitization	3	-	-	3	30	70	---
Practical's									
4.	PW861EE	Project Work- II /Internship in Industry			4	4	50	100	8
			09	00	04	10	140	310	14
		PROFESSIONAL ELECTIVE - V							
1	PE801EE	AI Techniques in Electrical Engineering /Selected Course from NPTEL							
2	PE802EE	Special Electrical Machines/ Selected Course from NPTEL							
3	PE803EE	Advanced Topics in Power Electronics/ Selected Course from NPTEL							
		OPEN ELECTIVE-III							
1	OE801EE	Illumination and Electric Traction Systems**/Selected Course from NPTEL**							
2	OE801ME	Industrial and Financial Management							
3	OE802ME	Composite Materials							
4	OE803ME	3-D Printing Technology							
5	OE801CE	Road Safety Engineering							
6	OE802CE	Green Building Technology							
7	OE801BE	Human Machine Interaction							
8	OE802BE	Instrumentation Engineering							
9	OE801CS	Data Science Using R							
10	OE801EC	Global and Regional Satellite Navigation Systems							

***OE801 EE Elective is not offered to the students of EE Department*

PE 801EE

AI Techniques in Electrical Engineering

(Professional Elective –V)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Artificial Neural Networks:

Introduction, Models of Neuron Network-Architectures –Knowledge representation, Artificial Intelligence and Neural networks–Learning process-Error correction learning, Hebbian learning –Competitive learning-Boltzman learning, supervised learning-Unsupervised learning–Reinforcement learning-Learning tasks.

ANN Paradigms:

Multi-layer perceptron using Back propagation Algorithm (BPA), Self –Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network.

Fuzzy Logic:

Introduction –Fuzzy versus crisp, Fuzzy sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy cartesion Product, Operations on Fuzzy relations –Fuzzy logic –Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods

Genetic Algorithms:

Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modeling –Genetic operators-Cross over-Single site cross over, Two point cross over –Multi point cross over-Uniform cross over, Matrix cross over-Cross over Rate-Inversion & Deletion, Mutation operator –Mutation –Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm.

Applications of AI Techniques:

Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and two area system, Small Signal Stability (Dynamic stability), Reactive power control , Speed control of DC and AC Motors.

Reading:

1. S.Rajasekaran and G.A.V.Pai Neural Networks, Fuzzy Logic & Genetic Algorithms, PHI, New Delhi, 2003.
2. Rober J. Schalkoff, Artificial Neural Networks, Tata McGraw Hill Edition, 2011
3. P.D.Wasserman; Neural Computing Theory & Practice, Van Nostrand Reinhold, New York, 1989.
4. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall,1992
5. D.E.Goldberg, Genetic Algorithms, Addison-Wesley 1999.

PE 802 EE

SPECIAL ELECTRICAL MACHINES

(Professional Elective –V)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

UNIT -I

Stepper Motors: Constructional features, Principle of operation, Variable Reluctance (VR) stepping motor-Single Stack, Multi-Stack, Permanent Magnet Step motor, Hybrid Step Motor, Torque Equation Open Loop Drive, Open loop and closed loop control of Step Motor, Applications.

UNIT -II

Switched Reluctance Motors: Constructional features, Principle of Operation, Torque equation, Torque-speed characteristics, Power Converter for SR Motor-Asymmetrical converter, DC Split converter, Control of SRM, Rotor Position sensors, Current Controllers, Applications.

UNIT-III

Permanent Magnet Synchronous Motor: Permanent magnets and their characteristics, Machine Configurations-SPM, SIPM, IPM and Interior PM with circumferential, Sensorless control, Applications.

UNIT -IV

Brushless DC Motor: Construction, Principle of Drive operation with inverter, Torque speed Characteristics, Closed loop control, Sensorless control, Applications.

UNIT-V

Linear Induction Motors and Linear Synchronous Motors: Linear induction motor, Construction details, LIM Equivalent Circuit, Steps in design of LIM, Linear Synchronous Motor: Principle and Types of LSM, LSM Control, Applications.

Suggested Reading:

1. R.Krishnan, *Electric Motor Drives*, Pearson , 2007
2. B.K.Bose, *Modern Power Electronics and AC Drives*, PHI, 2005
3. Venkataratnam, *Special electrical Machines*, University Press, 2008
4. E.G.Janardanan, *Special Electrical Machines*, PHI, 2014
5 T.J.E.Miller, *Brushless Permanent Magnet and Reluctance Motor Drive*, Clarendon Press, Oxford, 1989

EE3305

ADVANCED TOPICS IN POWER ELECTRONICS

(Professional Elective –V)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Unit-I

Introduction to switches - Advanced Silicon devices - Silicon HV thyristors, MCT, BRT &EST. SiC devices - diodes, thyristors, JFETs & IGBTs. Gallium nitrate devices - Diodes, MOSFETs.

Unit -II

Pulse Width Modulated Rectifiers: Properties of ideal rectifier, realization of near ideal rectifier, control of the current waveform, single phase and three-phase converter systems incorporating ideal rectifiers and design examples. Non-linear phenomena in switched mode power converters: Bifurcation and Chaos.

Unit-III

Control of DC-DC converters- State space modeling of Buck, Boost, Buck-Boost, Cuk Fly back, Forward, Push-Pull, Half & Full-bridge converters. Closed loop voltage regulations using state feedback controllers.

Soft-switching DC - DC Converters: zero-voltage-switching converters, zero-current switching converters, Multi-resonant converters and Load resonant converters.

Unit-IV

Advance converter topologies - Multi level converters - Cascaded H-Bridge, Diode clamped, NPC, Flying capacitor. Modular Multi-level converters(MMC), Multi-Input DC-DC Converters, Multi pulse PWM current source converters, Interleaved converters, Z-Source converters.

Unit-V

Control Design Techniques for Power Electronic Systems- Modeling of systems, Digital Controller Design, Optimal and Robust controller Design.

Suggested Reading:

1. Andrzej M Trzynadlowski, ‘Introduction to Modern Power Electronics, John Wiley and sons. Inc, New York, 1998
2. L. Umanand, ‘Power Electronics Essentials &Applications’, Wiley publishing Company, 1st Edition, 2014
3. B. JayantBalinga, 'Advanced High Voltage Power Device Concepts', Springer New York 2011. ISBN 978-1-4614-0268-8
4. BIN Wu, ' High Power Converters and AC Drives', IEEE press Wiley Interscience, a John wiley& sons Inc publication 2006

OE801EE

ILLUMINATION AND ELECTRIC TRACTION

(Open Elective-III)

Instruction	:	4 Periods per week
Duration of University Examination	:	3 Hours
University Examination	:	70 Marks
Sessional	:	30 Marks
Credits	:	3

Course Objectives:

- To introduce the students and understand Utilization of electrical energy for various applications like industrial heating, welding etc.,
- To understand the concept of illumination, and know the applications of various lamps to factory lighting, street lighting etc.
- To understand the concept of electrification of traction system.

UNIT-I

Industrial Heating: Advantages and methods of electric heating. Description, operation and performance of resistance ovens — Design of elements. Core type, Coreless type furnaces, High frequency eddy current heating, Dielectric heating. Arc furnace. Electric welding, Resistance welding, welding transformer and its rating, various types of Electric arc welding and electric resistance welding.

UNIT-II

Schematic Utilization and Connection Diagrams for Motor Control: Two supply sources for 3 phase Induction motors. Direct reversing, remote control operation, and jogging operating of Induction motor. Contactor control circuit. Push button control stations. Over load relays, limit switches, float switches. Interlocking methods for reversing control.

UNIT-III

Illumination: Introduction, nature and production of light, Sensitivity of the eye, Units of light. The inverse square law and cosine law, Solid angle, Lighting calculations — Determination of M.S.C.P, Rousseau's construction, Discharge lamps, Sodium vapour lamps, Mercury vapour lamps — Fluorescent lamp, Starting and power factor corrections, Stroboscopic effects — Neon signs, Application to factory lighting, Street lighting and Flood lighting.

UNIT-IV

Electric Traction: System of Electric Traction — Transmission of drive — Systems of track electrification — Traction mechanics — Speed time curves — Tractive effort — Power of Traction motor — Specific energy consumption — Mechanics of train movement— Coefficient of adhesion.

Traction Motors: Desirable characteristics, d.c series motors, a.c series motors 3-phase induction motors, d.c motor series & parallel control, Energy saving.

UNIT-V

Train Lighting: Systems of train lighting — Special requirements of train lighting — Methods of obtaining unidirectional polarity — Methods of obtaining constant output — Single battery system — Double battery parallel block system — Principal equipment of double battery system — Coach wiring — Dynamo.

Batteries: Lead acid batteries, SMF batteries, Construction and maintenance, Charging and rating of batteries.

Suggested Reading:

1. Partab H, Art and Science of Utilization of Electric Power, Dhanpat Rai & Sons, 1997.
2. K.B. Raina & S.K. Bhattacharya, Electrical Design, Estimating
3. and Costing, Wiley Eastern Ltd., 1991.
4. Partab H, Modern Electric Traction, Dhanpat Rai & Sons, 2000.
5. B.L.Theraja, A Text Book of Electrical Technology, S.Chand & Company Ltd, Vol —I.

OE802ME

INDUSTRIAL AND FINANCIAL MANAGEMENT

(Open Elective-III)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Course Objectives:

- To understand various types of organizational structures, manufacturing processes and importance of plant layout and the role of scheduling function in optimizing the utilization of resources
- To understand the importance of quality, inventory control and concepts like MRP I and MRP II
- To understand the nature of financial management and concepts like breakeven analysis, depreciation and replacement analysis

Course Outcomes:

At the end of this course student is expected reach the following outcomes.

- Understand the different phases of product life cycle, types of manufacturing systems, plant layout optimization problems and role of scheduling function in better utilization of resources
- Understand the Fundamental concepts of quality control, process control, material control and appreciate the importance of MRP-I and MRP –II.
- Know the different terminology used in financial management and understand the different techniques of capital budgeting and various types of costs involved in running an industrial organisation.

UNIT-I

Types of organizations, organizational structures. Designing Products, Services and Processes: New product design and development. Product life cycle: phasing multiple products. Manufacturing process Technology: Product, job shop, batch, assembly line and continuous process technology; flexible manufacturing systems. Design of Services, service process technology operations capacity; capacity planning decisions, measuring capacity; estimating future capacity needs.

UNIT-II

Locating production and services facilities, effects of location and costs and revenues, factor rating, simple median model (linear programming) Layout planning; process layout; product layout — Assembly lines; line balancing manufacturing cellular layout. Scheduling systems and aggregate planning for production and services; loading assignment algorithm; priority sequencing and other criteria.

UNIT-III

Quality planning and Control: basic concepts, definitions and history of quality control. Quality function and concept of quality cycle. Quality policy and objectives. Economics of quality and measurement of the cost of quality. Quality considerations in design.

Process control: machine and process capability analysis. Use of control charts and process engineering techniques for implementing the quality plan. Acceptance sampling: single, double and multiple sampling, operating characteristic Curve - calculation of producers risk and consumers risk.

UNIT-IV

Inventory control: deterministic and stochastic inventory models; variable demand; lead time, specific service level, perishable products and service.

Inventory control in application; concepts for the practioners; saving money in inventory systems; ABC classifications. Inventory control procedures; Quantity - reorders versus periodic inventory systems; material requirement planning (MRP); MRP as a scheduling and ordering system; MRP system components; MRP computational procedure; Detailed capacity planning; MRP - limitation and advantages; Manufacturing Resources Planning (MRP-II).

UNIT-V

Elements of cost, overheads, breakeven analysis, depreciation, replacement analysis. Nature of financial management-time value of money, techniques of capital budgeting and method, cost of capital, financial leverage.

Suggested Reading

1. Buifa and Sarin, "Production and operations management" - Wiley Publications.
2. I.M. Pandey, "Elements of Financial Management" Vikas Publications, New Delhi, 1994.
3. James C. Van Home & John, M. Wachowicz, Jr., "Fundamentals of Financial Management", Pearson Education Asia, 11^{th} ed. 2001.

OE801ME

COMPOSITE MATERIALS

(Open Elective-III)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Course Objectives:

- To know the properties of fiber and matrix materials used in composites, as well as some common manufacturing techniques.
- To know the various moulding process and architecture of composite laminates
- To know how to estimate the laminate properties from lamina properties.
- To understand the strength of an orthotropic lamina and measurement of basic composite properties.

Course Outcomes:

At the end of this course student is expected reach the following outcomes.

- Understand the distinction of composites, its advantages, classification and applications
- Predict the properties of composite lamina and laminate
- Understand the testing of composites and design the structure using the appropriate design criteria.

UNIT-I

Introduction to composite materials, general characteristics, Fibres, Matrix materials, interfaces, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon fibre composites

UNIT-II

Molding Processes: hand layup, vacuum molding, compression molding, pultrusion molding, centrifugal molding, filament winding, prepegs and molding compounds and architecture of composite materials: laminates, sandwich composites and other achitectures.

UNIT-III

Micromechanics of Composites: Mechanical properties: Production of Elastic constant, micromechanical approach, Halpin-Tsal equations, Transverse stresses. Thermal properties: Hygrothermal stresses, mechanics of load transfer from matrix to fibre.

UNIT-IV

Macromechanics of Composites: Elastic constants of a lamina, relations between engineering constants and reduced stiffness and compliances, variation of lamina properties with orientation, analysis of laminated composites, stresses and strains with orientation.

UNIT-V

Strength of an orthotropic lamina: Maximum stress theory, maximum strain criteria, maximum work (Tsai-Hill) criterion, quadratic interaction criteria. Designing with composite materials. Measurement of constituent material properties: Fibre tests, Matrix tests. Measurement of basic composite properties: Tensile test, compressive test, a plane shear test, interlaminar shear test, flexure test.

Suggested Reading:

1. Jones, R.M., "Mechanics of Composite Materials", McGraw Hill Co., 1967.
2. Ronald F. Gibson, "Principles of Composite Materials Mechanics", McGraw-Hill, Inc., 1994.
3. Krishan, K. Chewla, "Composite Material", Springer - verlag, 1987.
4. Carl. T. Herakovich, "Mechanics of Fibrous Composites", John Wiley Sons Inc., 1998.

OE803ME

3D PRINTING TECHNOLOGY

(Open Elective-III)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Course Objectives:

- To understand the fundamental concepts of 3D Printing, its advantages and limitations.
- To classify various types of 3D Printing Processes and know their working principle,
- advantages, limitations etc.
- To have a holistic view of various applications of these technologies in relevant fields such as
- Mechanical, Bio-medical, Aerospace, electronics etc.

Course Outcomes:

Upon competition of this course the student will be able to:

- Understand the significance of 3D Printing and compare it with conventional manufacturing process.
- Classify various types of 3D PRINTING processes, rapid tooling and understand the working principle and applications of them with case studies.
- Know the various types of errors that creep up while saving the .STL file format and also will be able to appreciate the features of various types of software's used in 3D Printing.
- Appreciate the diversified applications of 3D PRINTING in various fields like biomedical, aerospace, automobile, defence, architecture etc.

UNIT-I

Introduction: Prototyping fund3D Printingentals, Historical development, Fund3D Printingentals of 3D PRINTING, Advantages and Limitations of 3D PRINTING , Commonly used Terms, Classification of 3D PRINTING process, 3D PRINTING Process Chain: Fund3D Printingental Automated Processes, Process Chain.

UNIT-II

Liquid-based 3D Printing Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies

Solid-based 3D Printing Systems: L3D Printinginated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT-III

Powder Based 3D Printing Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Laser Engineered Net Shaping (LENS), Electron Be3D Printing Melting.

UNIT-IV

3D Printing Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Rapid Prototyping Software's: Features of various RP software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.

UNIT-V

Applications of 3D Printing : Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewellery Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules. Printed electronics, Biopolymers, Packaging

Suggested Reading:

1. Chua C.K., Leong K.F. and LIM C.S, Rapid prototyping; Principles and Applications, World Scientific Publications , Third Edition, 2010.
2. D.T. Ph3D Printing and S.S. Dimov, Rapid Manufacturing, Springer, 2001.
3. TerryWohlers, Wholers Report 2000, Wohlers Associates, 2000.
4. PaulF.Jacobs, Rapid Prototyping & Manufacturing ASME Press, 1996

OE 801 CE

ROAD SAFETY ENGINEERING

(Open Elective - III)

Instruction	: 3 periods per week
Duration of Semester End Examination	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives

- Introduction to various factors considered for road safety and management
- Explain the road safety appurtenances and design elements
- Discuss the various traffic management techniques

Course Outcomes

- Prepare accident investigation reports and database
- Apply design principles for roadway geometrics improvement with various types of traffic safety appurtenances/tools
- Manage traffic including incident management

UNIT - I

Road accidents: Causes, scientific investigations and data collection, Analysis of individual accidents to arrive at real causes, statistical methods of analysis of accident data, Basic concepts of Road accident statistics, Safety performance function: The empirical Bayes method Identification of Hazards road location. Application of computer analysis of accident data.

UNIT-II

Safety in Road Design: Operating the road network for safety, highway operation and counter measures, road safety audit, principles-procedures and practice, code of good practice and checklists, vehicle design factors & Driver characteristics influencing road safety.

UNIT - III

Road Signs and Traffic Signals: Classification, Location of Signs, measures of sign effectiveness, Types of visual perception, sign regulations, sign visibility, sign variables, Text versus symbols. Road Marking: Role of Road markings, Classification, visibility. Traffic Signals: Need, Signal face. Illumination and location of Signals, Factors affecting signal design, pedestrians' safety, fixed and vehicle actuated signals. Design of signa1s, Area Traffic control. Delineators, Traffic Impact Attenuators, Road side rest areas, Safety Barriers, Traffic Aid Posts.

UNIT-IV

Traffic Management Techniques: Integrated safety improvement and Traffic Calming Schemes, Speed and load limit, Traffic lights, Safety cameras, Tests on driver and vehicles, pedestrian safety issues, Parking, Parking enforcement and its influence on Accidents. Travel Demand Management; Methods of Traffic management measures: Restriction of Turning Movements, One way streets, Tidal Flow Operation Methods, Exclusive Bus Lanes and Closing Side-streets; Latest tools and techniques used for Road safety and traffic management. Road safety issues and various measures for road safety; Legislation, Enforcement, Education and Propaganda, Air quality, Noise and Energy Impacts; Cost of Road Accidents.

UNIT-V

Incident Management: Introduction, Characteristics of Traffic Incidents, Types of Incidents, Impacts, Incident management process, Incident traffic management; Applications of ITS: Motorist information, Equipment used; Planning effective Incident management program, Best practice in Incident management programs. National importance of survival of Transportation systems during and after all natural disasters especially cyclones, earthquakes, floods etc and manmade disasters like sabotage, terrorism etc.

Suggested Reading

1. Guidelines on Design and Installation of Road Traffic Signals, IRC:93.
2. Specification for Road Traffic Signals, IS: 7537-1974.
3. Principles and Practice of Highway Engineering by L.R. Kadiyali andN.B.Lal.
4. Hand book of T.E. Myer Kutz, Editor McGraw Hill, 2004.

OE 802 CE

GREEN BUILDING TECHONOLOGIES

(Open Elective - III)

Instruction	: 3 periods per week
Duration of Semester End Examination	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

- Exposure to the green building technologies and their significance.
- Understand the judicial use of energy and its management.
- Educate about the Sun-earth relationship and its effect on climate.
- Enhance awareness of end-use energy requirements in the society.
- Develop suitable technologies for energy management.

Course Outcomes:

- Understand the fundamentals of energy use and energy processes in building.
- Identify the energy requirement and its management.
- Know the Sun-earth relationship vis-a-vis its effect on climate.
- Be acquainted with the end-use energy requirements.
- Be familiar with the audit procedures of energy.

UNIT- I

Overview of the significance of energy use and energy processes in building: Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT-II

Indoor environmental requirement and management: Thermal comfort - Ventilation and air quality – Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

UNIT-III

Climate, solar radiation and their influences: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT-IV

End-use, energy utilization and requirements: Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building - Heat gain and thermal performance of building envelope - Steady and non steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer

UNIT-V

Energy management options: Energy audit and energy targeting - Technological options for energy management.

Suggested Reading:

1. Michael Bauer, Peter Mösle and Michael Schwarz, "Green Building – Guidebook for Sustainable Architecture", Springer, Heidelberg, Germany, 2010.
2. Norbert Lechner, *"Heating, Cooling, Lighting - Sustainable Design Methods for Architects",* Wiley, New York, 2015.
3. Mike Montoya, *"Green Building Fundamentals*", Pearson, USA, 2010.
4. Charles J. Kibert, *"Sustainable Construction - Green Building Design and Delivery*", John Wiley & Sons, New York, 2008.
5. Regina Leffers, *"Sustainable Construction and Design*", Pearson / Prentice Hall, USA, 2009.
6. James Kachadorian, *"The Passive Solar House: Using Solar Design to Heat and Cool Your Home",* Chelsea Green Publishing Co., USA, 1997.

OE861 BE With effect from the academic year 2018-2019

INSTRUMENTATION ENGINEERING
(OPEN ELECTIVE-III)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
Semester End Examination	70 Marks
Sessionals	30 Marks
Credits	3

OBJECTIVES:

- to understand the need of instrument
- understand the principle of operation of different sensors
- to design signal conditioning circuits for different industrial sensors
- to design the instruments.

UNIT I

Instrument, block diagram of an instrument, Principles of transduction and measurement, Sensor Classification, Functional specifications of sensors; static and dynamic characteristics of measurement systems. Primary sensors, bimetals, Bellows, Bourdon tube, capsule, diaphragm, applications.

UNIT – II

Resistive sensors. Potentiometers, Strain gages, RTDs, Thermistors, LDR. Signal conditioning. Wheatstone bridge, balance and deflection measurements. Instrumentation amplifier. Interference types and reduction. Shield grounding. Isolation amplifiers, Applications.

UNIT-III

Reaction variation and electromagnetic sensors. Capacitive sensors, inductive sensors, LVDT, electromagnetic sensors. Signal conditioning, AC bridges, AC amplifiers, electrostatic shields, carrier amplifiers, phase-sensitive detectors, Applications.

UNIT-IV

Self-generating sensors. Thermoelectric sensors, thermocouples, piezoelectric sensors, photovoltaic sensors. Signal conditioning. chopper and low-drift amplifiers, Noise in op-amps. Digital sensors. Telemetry and data acquisition, Applications.

UNIT-V

Other sensors: Accelerometer transducers, Gyroscopes, Ph sensors, measurement of Conductivity, viscosity, conductivity, flow meters, Humidity, signal conditioning and Applications.

Suggested Reading:

1. Ramon Pallas-Areny and John G.Webster, *Sensors and signal conditioning*, John Wiley and Sons, 1991.
2. Principles of measurements by J P Bentely
3. Electronic measurements and instrumentation by A K Sawhany

HUMAN-MACHINE INTERFACE
(OPEN ELECTIVE-III)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	70 Marks
Sessionals	30 Marks
Credits	3

Objectives:

- To stress the importance of a good interface design.
- To understand the importance of human psychology in designing good interfaces.
- To motivate students to apply HMI in their day – to – day activities.
- To bring out the creativity in each student – build innovative applications that are user friendly.
- To encourage students to indulge into research in Machine Interface Design.

Outcomes: Learner will be able to…

- To design user centric interfaces.
- To design innovative and user friendly interfaces.
- To apply HMI in their day-to-day activities.
- To criticise existing interface designs, and improve them.
- To Design application for social and technical task.

UNIT-I:
Introduction - Introduction to Human Machine Interface, Hardware, software and operating environment to use HMI in various fields.
The psychopathology of everyday things – complexity of modern devices; human-centered design; fundamental principles of interaction; Psychology of everyday actions- how people do things; the seven stages of action and three levels of processing; human error

UNIT-II:
Understanding goal directed design - Goal directed design; Implementation models and mental models; Beginners, experts and intermediates – designing for different experience levels; Understanding users; Modeling users – personas and goals.

UNIT-III:
GUI - benefits of a good UI; popularity of graphics; concept of direct manipulation; advantages and disadvantages; characteristics of GUI; characteristics of Web UI; General design principles.

UNIT-IV:
Design guidelines - perception, Gesalt principles, visual structure, reading is unnatural, color, vision, memory, six behavioral patterns, recognition and recall, learning, factors affecting learning, time.

UNIT-V:
Interaction styles - menus; windows; device based controls, screen based controls.
Communication - text messages; feedback and guidance; graphics, icons and images; colours.

Suggested Reading:

1. Alan Dix, J. E. Finlay, G. D. Abowd, R. Beale “Human Computer Interaction”, Prentice Hall.
2. Wilbert O. Galitz, “The Essential Guide to User Interface Design”, Wiley publication.
3. Alan Cooper, Robert Reimann, David Cronin, “About Face3: Essentials of Interaction design”, Wiley publication.
4. Jeff Johnson, “Designing with the mind in mind”, Morgan Kaufmann Publication.
5. Donald A. Normann, “Design of everyday things”, Basic Books; Reprint edition 2002.

OE 801 CS *With effect from the Academic year 2018-2019*

DATA SCIENCE USING R

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	70 Marks
Sessional	30 marks
Credits	3

UNIT-I

Introduction To R: Introduction, Downloading and Installing R, IDE and Text Editors, Handling Packages in R.

Getting Started With R: Introduction, Working with Directory, Data Types In R, Few Commands for Data Exploration.

Loading and Handling Data In R: Introduction, Challenges of Analytical Data Processing, Expression, Variables, Functions, Missing Values Treatment In R, Using 'As' Operator To Change The Structure Of The Data, Victors, Matrices, Factors, List, Few Common Analytical Tasks, Aggregation And Group Processing Of A Variable, Simple Analysis Using R, Methods For Reading Data, Comparison Of R GUI's For Data Input, Using R With Databases And Business Intelligence Systems.

UNIT-II

Exploring Data In R: Introduction, Data Frames, R Functions for Understanding Data in Data Frames, Load Data Frames, Exploring Data, Data Summary, Finding the Missing Values, Invalid Values And Outliers, Descriptive Statistics, Spotting Problems In Data with Visualization.

UNIT- III

Linear Regression Using R: Introduction, Model Fitting, Linear Regression, Assumptions of Linear Regression, Validating Linear Assumption.

Logistic Regression: Introduction, What Is Regression?,Introduction To Generalized Linear Model, Logistic Regression, Binary Logistic Regression, Diagnosing Logistic Regression, Multinomial Logistic Regression Model.

UNIT IV

Decision Tree: Introduction, What Is A Decision Tree?,Decision Tree Representation In R, Appropriate Problems For Decision Tree Learning, Basic Decision Tree Learning Algorithm, Measuring Features, Hypothesis Space Search In Decision Tree Learning, Inductive Bias In Decision Tree Learning, Why Prefer Short Hypotheses, Issues In Decision Tree Learning.

Time Series In R: Introduction, What Is Time Series Data, Reading Time Series Data, Decomposing Time Series Data, Forecasts Using Exponential Smoothing, ARIMA Models.

UNIT-V

Clustering: Introduction, What Is Clustering, Basic Concepts in Clustering, Hierarchical Clustering, K-Means Algorithm, CURE Algorithm, Clustering in Non-Euclidean Space, Clustering for Streams and Parallelism.

Association Rules: Introduction, Frequent Itemset, Data Structure Overview, Mining Algorithm Interfaces, Auxiliary Functions, Sampling from Transaction, Generating SyntheticTransaction Data, Additional Measures of Interestingness, Distance Based Clustering Transaction and Association.

Text Mining: Introduction, Definition of Text Mining, A Few Challenges in Text Mining, Text Mining Verses Data Mining, Text Mining In R, General Architectures of Text Mining Systems, Pre-Processing of Documents In R, Core Text Mining Operations, Using Background Knowledge for Text Mining, Text Mining Query Languages.

Mining Frequent Patterns, Associations and Correlations: Basic Concepts and Methods.

Frequent Itemset, Closed Itemset And Association Rules.

Frequent Itemset: Mining Methods, Pattern Evaluation Methods, Sentiment Analysis

Suggested Reading:

1. Data Analytics using R by Seema Acharya. McGraw Hill education.
2. Practical Data Science with R, Nina Zumel and John Mount, Manning Shelter Island.
3. The R book, Crawley, Michael J. John Wiley & Sons, Ltd

OE 801 EC

GLOBAL AND REGIONAL SATELLITE NAVIGATION SYSTEMS

(Open Elective-III)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Course Objectives

- To explain the basic principle of GPS and its operation.
- To make the students to understand signal structure.
- To make the students understand the GPS errors.
- Highlight the importance of integrating GPS with other systems.
- To make the students understand about various GRNSS.

Course Outcomes:

Student will be

- Able to understand the principle and operation of GPS.
- Able to understand the GPS Signal structure and services.
- Able to understand about various errors.
- Able to use of GPS in various fields such as navigation, GIS etc.
- Able to understand principle of Operation of various GRNSS.

UNIT-I

Introduction to Satellites, their properties, Orbits and Launch vehicles, Kepler's Laws, GPS fundamentals: Principle of Trilaiteration, Transit, GPS Operating Principle, Architecture: Space, Control and User Segments and its Frequencies.

UNIT -II

GPS Signal structure: C/A and P-Codes, SPS and PPS services, GPS Coordinate Systems: Significance, Types of GPS receivers, Selective Availability, Spoofing and Anti-spoofing.

UNIT-III

GPS Errors: Ionospheric error, Tropospheric error, Ephemeris error, Clock errors, Satellite and receiver instrumental biases, Multipath; Dilution of Precision (DOP).

UNIT-IV

GPS Modernization: Future GPS satellites, New signals and their benefits, New Control Segment, Principle of operation of DGPS, architecture and limitations, GPS Applications: Surveying Mapping Marine, air and land Navigation, Military and Space Application.GPS

Integration with Geographic Information System (GIS), Inertial Navigation System (INS), Pseudolite and Cellular.

UNIT-V

Other GRNSS: GLONASS, GALILEO, QZNSS, CNSS and IRNSS System: Principle of Operation, Features and their Current Status.

Suggested Readings:

1. Ahmed El-Rabbany, "*Introduction to GPS"*, Artech House Publishers, 2/e, Boston 2006.
2. Elliot D Kaplan and Christopher J Hegarty," *Understanding GPS principles and applications*", Artech House Publishers, 2/e Boston & London 2005.
3. B.Hofmann-Wellenhof, H.Lichtenegger, and J.Collins, "*GPS Theory and Practice,"* Springer Verlog, 5/e, 2008.

MC901EG

GENDER SENSITIZATION

Instruction	:	3
Duration of SEE	:	3 hours
CIE	:	30 Marks
SEE	:	70 Marks

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.

UNIT-I

UNDERSTANDING GENDER:

Why Should We Study It? Socialization: Making **Women, Making Men:** Introduction-Preparing for Womanhood-Growing up male-First lessons in caste-Different Masculinities;

Just Relationships: Being Together as Equals: Mary Kom and Onler- Love and acid just do not mix-Love Letters-Mothers and Fathers-Further reading: Rosa Parks-The brave heart.

UNIT-II

GENDER AND BIOLOGY: Missing Women: Sex selection and Its Consequences – Declining sex ratio. Demographic Consequences; Gender Spectrum: Beyond the Binary – Two or many – Struggles with discrimination; Our Bodies, Our Health.

UNIT-III

GENDER AND LABOUR: Housework: the Invisible Labour: "My mother doesn't work"- Share the Load"; **Women's Work; Its Politics and Economics:** Fact and fiction- Unrecognized and unaccounted work- Wages and conditions of work.

UNIT-IV

ISSUES OF VIOLENCE: Sexual Harassment: Say No! : Sexual harassment – not eve-teasing-Coping with everyday harassment-"Chupulu"; **Domestic Violence: Speaking Out:** Is home a safe place? When women unite-Rebuilding lives-New forums for justice; **Thinking about Sexual Violence:** Blaming the victim – "I fought for my life". The caste face of violence.

UNIT – V

GENDER STUDIES: Knowledge - Through the Lens of Gender - Point of view - Gender and the structure of knowledge – Unacknowledged women artists of Telangana: **Whose History? Questions for Historians and Others:** Reclaiming a past-Writing other histories-Missing pages from modern Telangana history.

Suggested Reading:

1. A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, *"Towards a World of Equals: A Bilingual Text book on Gender"* Telugu Akademi, Hyderabad, 1st Edition, 2015.
2. www.halfthesky.cgg.gov.in

PW861EE

PROJECT WORK-II

Instruction	:	6 Periods per week
Duration of University Examination	:	Viva
University Examination	:	Grade*
Sessionals	:	50 Marks

Objectives:

- To enhance practical and professional skills.
- To familiarize tools and techniques of systematic Literature survey and documentation
- To expose the students to industry practices and team work.
- To encourage students to work with innovative and entrepreneurial ideas
- .

Outcomes:

- demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to real-world problems
- evaluate different solutions based on economic and technical feasibility
- effectively plan a project and confidently perform all aspects of project management
- Demonstrate effective written and oral communication skills

The aim of project work –II is to implement and evaluate the proposal made as part of project - I . Students can also be encouraged to do full time internship as part of project work-II based on the common guidelines for all the departments . The students placed in internships need to write the new proposal in consultation with industry coordinator and project guide within two weeks from the commencement of instruction.

The department will appoint a project coordinator who will coordinate the following:

Re-grouping of students - deletion of internship candidates from groups made as part of project work-I

Re-Allotment of internship students to project guides

Project monitoring at regular intervals

All re-grouping/re-allotment has to be completed by the 1nd week of VIII^{t} semester so that students get sufficient time for completion of the project.

All projects(internship and departmental) will be monitored at least twice in a semester through student presentation for the award of sessional marks. Sessional marks are awarded by a monitoring committee comprising of faculty members as well as by the supervisor. The

first review of projects for 25 marks can be conducted after completion of five weeks. The second review for another 25 marks can be conducted after 12 weeks of instruction.

Common norms will be established for the final documentation of the project report by the respective departments. The students are required to submit draft copies of their project report within one week after completion of instruction.

Note: Three periods of contact load will be assigned to each project guide.