UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

V SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME -2013

V SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING (E)

Course No	Name of subject	Credits	Weekly load, hours			C A Marks	Exam Duration Hrs	U E Max Marks	Total Marks
			L	T	D/ P				
13.501	Engineering Mathematics IV (E)	4	3	1	-	50	3	100	150
13.502	Synchronous Machines(E)	4	2	2	0	50	3	100	150
13.503	Switchgear and Protection(E)	3	2	1	0	50	3	100	150
13.504	Control Systems(E)	4	2	2	0	50	3	100	150
13.505	Electronic Instrumentation(E)	3	2	1	0	50	3	100	150
13.506	ELECTIVE I	3	2	1	0	50	3	100	150
13.507	Power Electronics Lab(E)	4	0	0	4	50	3	100	150
13.508	Measurements & Instrumentation Lab(E)	4	0	0	4	50	3	100	150
	Total	**29**	**13**	**8**	**8**	**400**		**800**	**1200**

13. 506 Elective I

13.506.1	Engineering Material Science (E)
13.506.2	Operations Research (E)
13.506.3	Sustainable Development (E)
13.506.4	New and renewable Energy Sources (E)
13.506.5	Disaster Management (E)
13.506.6	Computer Organisation (E)
13.506.7	Professional Communication (E)

13.501 ENGINEERING MATHEMATICS - IV (E)
(PROBABILITY, RANDOM PROCESSES and NUMERICAL TECNIQUES)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To provide a basic understanding of random variables and probability distributions.*
- *To have a basic idea about Random process-its classification, types and properties and their applications in engineering fields.*
- *Numerical techniques for solving differential equations are also introduced as a part of this course*

Module – I

Numerical techniques-Solutions of algebraic and transcendental equations-Bisection method-Regula falsi method - Newton- Raphson method. Solution of system of equations-Gauss elimination, Gauss- Siedel iteration. Interpolation–Newton's Forward and backward formulae - Lagrange's interpolation formula.

Module – II

Numerical integration-Trapezoidal Rule- Simpson's one third rule.

Numerical solution of ODE –Taylor's series method- Euler's method-Modified Euler's method -Runge kutta method of order 4.

Numerical Solution of two-dimensional partial differential equation(Laplace equation)-using finite difference method(five point formula).

Module – III

Random Variables -Discrete and continuous random variables -Probability distributions.-Mathematical Expectation and properties.

Special probability distributions-Binomial distribution, Poisson distribution, Poisson approximation to Binomial, Uniform distribution, Exponential Distribution, Normal distribution- mean and variance of the above distributions(derivations except for normal distribution), Simple problems.

Module – IV

Two dimensional random variables-Joint and marginal distributions-Expectations-Conditional probability distributions –independence.

Random processes-Types of random processes-Strict sense stationary process (SSS) and Wide sense stationary (WSS) process-Autocorrelation, autocovariance and their properties(without proof) **-**Poisson process-mean and variance-simple problems.

Power spectral density (PSD)-PSD of real processes and its properties. Relation between autocorrelation and power spectral density.

References:

1. Veerarajan T., Probability ,Statistics and Random Processes, III Edition,TMH
2. Papoulis and S.U Pillai, Probability ,Random Variables and Stochastic Processes, III Edition,TMH .
3. Koneru Sarveswara Rao, Engineering Mathematics, II Edition, Universities Press.
4. Sastry S.S., Introductory Methods of Numerical Analysis , V Edition, PHI
5. Babu Ram, Numerical Methods, I Edition, Pearson.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the student will be familiar with the various concepts of Random process which are essential in Electrical and Electronics Engineering and they will be able to use numerical methods to solve problems related to engineering fields.

13.502 SYNCHRONOUS MACHINES (E)

Teaching Scheme: 2(L) - 2(T) - 0(P) **Credits**: 4

Course Objectives:

To expose the students to the concepts of synchronous machines (alternators and synchronous motors) including the Constructional details, principle of operation, and Performance analysis.

Module – I

Alternators: Basic Principle – Constructional features of salient pole type and cylindrical type alternators- advantages rotating type (stationary armature) - damper winding - turbo alternator - armature winding - Types of armature winding- single Layer, double Layer, full Pitched, fractional pitched winding- slot angle- Pitch Factor and Distribution Factor (Derivation) - Simple Problems. Effect of pitch factor on harmonics – advantages of short chorded winding- EMF Equation – Problems. Cooling of alternator – different methods. Harmonics in generated EMF – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics.

Module – II

Performance of an alternator: Causes for voltage drop in alternators – armature resistance – armature leakage reactance – armature reaction – synchronous reactance – vector diagram of a loaded alternator – voltage regulation- EMF, MMF, ZPF and A.S.A methods – Problems. Load characteristics of alternators – Theory of salient pole machine – Blondel's two reaction theory- direct axis and quadrature axis synchronous reactances- phasor diagram and calculation of voltage regulations- determination of X_d and X_q by slip test.

Module – III

Parallel operation of alternators: Necessity of parallel operation of alternators – methods of synchronization - dark lamp method - bright lamp method - synchroscope method - principle of automatic synchronizing- synchronizing current - synchronizing power - synchronizing torque - effects of changing excitation of alternators - load sharing of two alternators.

Module – IV

Synchronous motor: Construction and principle of synchronous motor - methods of starting - effects of excitation on armature current and power factor – load angle – torque and power relationship- phasor diagram – losses and efficiency calculations. Synchronous

machine on infinite bus- V Curve and Inverted V Curve – Power flow equation for cylindrical and salient pole machines- power vs power angle diagram – reluctance power –maximum power transfer- stability limit- control of active and reactive power in synchronous machine on infinite busbars- applications of synchronous motors.

References

1. Nagrath J. and D. P. Kothari, *Theory of AC Machines*, Tata McGraw Hill, 2006.
2. Bimbra P. S., *Electrical Machinery*, 7/e, Khanna Publishers, 2011.
3. Say M. G., *The Performance and Design of A. C. Machines*, C B S Publishers, New Delhi, 2002.
4. Fitzgerald A. E., C.Kingsley and S.Umans, *Electric Machinery*, 5/e, McGraw Hill, 1990.
5. Langsdorf M. N., *Theory of Alternating Current Machinery*, Tata McGraw Hill, 2001.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

After the successful completion of this course, the students will be able to select the proper alternator or synchronous motor for a given application, based on a performance analysis.

13.503 SWITCHGEAR AND PROTECTION (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objectives:

This course will enable the students to learn the fundamental concepts of Power system components used for protection.

Module – I

Introduction – Need for power system protection. Switchgear: General requirements of circuit breakers- Auto re-closing feature – three pole & single pole auto re-closing. Formation of electric arc- Elementary principles of arc phenomenon - quenching theory - interruption of capacitive currents and low current chopping -resistance switching - Restriking voltage, recovery voltage and RRRV, Arc re-striking phenomena. Rating of circuit breakers and effect of transient current on it - specifications of circuit breaker.

Different types of arc quenching media and special devices for arc quenching -Principles of operations of various types of circuit breakers - air break – oil filled - air blast -vacuum and SF6 circuit breakers. -Vacuum Circuit Breaker-Operating Mechanism-relative merits and demerits of different types of Circuit Breakers. Specific field of usage. Testing of circuit breakers, D.C circuit breaking. Ethics and Aesthetics for Substation Switchyard. Fuses: Fuse Characteristics, Types of Fuses, Selection of Fuses.

Module – II

Protective relays - Introduction - evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection- Classification of Protective relays - Basic Relay Terminology and characteristics- attracted armature, balanced beam, induction disc, thermal relays- over current, earth fault and over voltage relays.

Directional and non- directional relays-Principle and application of directional over current and earth fault relays- Distance relays& their settings – impedance, reactance, mho and off set mho relays, errors and remedies to errors- Differential relays current and voltage comparison - circulating current and opposite voltage differential scheme. Negative sequence relays. Principle of Relay coordination.

Module – III

Static Relays: Introduction – basic component of static relays. Merits and Demerits- Comparators – amplitude and phase comparators. Over current relays –instantaneous over current relay – inverse time over current relays – differential relays. Microprocessor based

Protective relays: Block schematic and flow charts of over current relay, impedance relay and directional relay. Principle of numerical protection.

Module – IV

Protection of alternators, transformers and transmission lines: Differential protection for generators, transformers and transmission lines - field suppression of alternator - Buchholz's relay - over current and distance protection for feeders - Translay relay.

Grounding: Neutral grounding - solid grounding. Power System earthing –objective-tolerable limits of body current –step and touch voltage.

Over voltages and insulation requirements - Generation of over voltages - Switching surges - Protection against over voltages - Surge diverters - Insulation co-ordination - propagation of surges -Termination in inductance and capacitance - Determination of system voltages produced by travelling waves – Bewley lattice diagram - effects of line loss.

References:

1. Rao S. S., *Switchgear & Protection*, Khanna Publishers, 1986.
2. Paithankar Y. G. and S. R. Bhide, *Fundamentals of Power System Protection*, PHI, 2003.
3. Blackburn J. L., *Protective Relaying Principles and applications*, Marcel and Dekker Publishers, 1987.
4. Badriram and D. N. Vishwakarma, *Power System Protection and Switchgear*, Tata McGraw Hill, 2001.
5. Bakshi U. A. and M. V. Bakshi, *Switchgear and Protection*, Technical Publications, 2009.
6. Gupta B. R., *Power system Analysis and Design*, Wheeler Publishers, 1993.
7. Nagrath I. J. and D. P. Kothari, Power System Engineering, Tata McGraw Hill, 1994.
8. Wadhwa C. L., *Generation, Distribution and Utilisation of Electrical Energy,* Wiley Eastern, 1993.
9. Ravindranath B. and M. Chander, *Power System Protection and Switchgear*, Wiley Eastern, 1997.
10. Deshpande M. V., *Switchgear and Protection*, Tata McGraw Hill, 1997.
11. Grainger J. J. and W. D. Stevenson, *Power system Analysis*, McGraw Hill, 2003.
12. Rao T. S. M., *Digital/Numerical Relays*, McGraw Hill, 2005.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *Identify and interpret the type of risks faced by power systems*
- *Choose the appropriate switchgear for protection of any element in power systems*
- *Choose appropriate protection schemes for the protection of any element in power systems.*

13.504 CONTROL SYSTEMS (E)

Teaching Scheme: 2(L) - 2(T) - 0(P) **Credits**: 4

Course Objective:

The objective of this course is to provide a strong foundation on the analytical and design techniques on classical control theory and modeling of dynamic systems

Module – I

Open loop-and closed loop control systems: Transfer function -T.F of simple - Mechanical and Electromechanical systems – Force voltage and force current analogy - block diagram representation - block diagram reduction - signal flow graph - Mason's gain formula - characteristics equation. Control system components: DC and AC servo motor – synchro - magnetic amplifier - gyroscope - stepper motor - Tacho generator.

Module – II

Time domain analysis of control systems: Transient and steady state responses - test signals - time domain specifications - first and second order systems - impulse and step responses of first and second order systems- steady state error analysis - static error coefficient of type 0,1,2 systems - Dynamic error coefficients - PID controllers -Trade-off between steady state and transient behaviour.

Module – III

Concept of stability: Time response of poles - stability of feedback system - Routh's stability criterion - Root locus -General rules for constructing Root loci – stability range from root loci - effect of addition of poles and zeros.

Compensator design: Realization of compensators – lag, lead and lag-lead -Design of compensator using root locus.

Module – IV

Frequency domain analysis: Analysis based on Bode plot - Polar plot - Log magnitude vs. phase plot, Nichols chart. Frequency domain specifications - Non-minimum phase system - transportation lag- Nyquist stability criterion gain margin - phase margin - stability analysis using Bode plot. Compensator design: Design of compensator using Bode plot.

References:

1. Ogata K., *Modern Control Engineering*, Prentice Hall of India, New Delhi, 2010.
2. Nagarath I. J. and Gopal M., *Control System Engineering*, Wiley Eastern, 2008.
3. Dorf R. C. and R. H. Bishop, *Modern Control Systems*, Pearson Education, 2011.
4. Chen C.T., *Analog and Digital Control System Design: Transfer Function, State space and Algebraic Methods*, Saunders College Publishing, New York, 1993.
5. Nise N. S., Control Systems Engineering, 6/e, Wiley Eastern, 2010.
6. Kuo B. C., *Automatic Control Systems*, Prentice Hall of India, New Delhi, 2002.
7. Gibson J. E., F.B.Tuteur and J. R. Ragazzini, Control System Components, Tata McGraw Hill, 2013.
8. Gopal M., Control Systems Principles and Design, Tata McGraw Hill, 2008.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: *Question paper should be set to check the analytical, design and application skills. Descriptive questions should not exceed 20% of the maximum marks.*

Course Outcome:

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

- *Model any physical systems and analyse a given system to assess its performance.*
- *Design a suitable compensator to meet the required performance specifications.*

13.505 ELECTRONIC INSTRUMENTATION (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits:** 3

Course Objectives:

To introduce the basic concepts of Process Control System, and to provide sound knowledge in sensors, transducers, data converters, the signal conditioning circuits and the special purpose IC's used for the process instrumentation system.

Module – I

Process Control - block diagram, identification of elements. Sensor time response - first and second order responses. Description of control valves, actuators and current to pressure and pressure to current converters.

Review of operational Amplifier circuits - precision rectifier, ZCD, current to voltage converter, phase shifter, Instrumentation amplifier using three Op-Amps, Filters: active filters - frequency response of major active filters - Butterworth low pass, high pass and band pass filter, all pass filter, universal active filters- comparison between Butterworth and Chebyschev filters.

Module – II

Transducers: definition - primary and secondary transducers. Temperature measurements – Bimetallic thermometers – Electrical methods of temperature measurement-Signal conditioning of industrial RTDs and their characteristics-3 lead and 4 lead RTDs - Thermistors. Thermocouples - associated signal conditioning circuits. Cold Junction Compensation, Optical pyrometers, infrared thermometry**.** Measurement of fluid flow - electromagnetic flow meters - ultrasonic flow meters Displacement transducers - LVDT - principle, gray code encoders Measurement of force and pressure - strain gauges - semiconductor strain gauge - bridge configuration of strain gauges - load cells - piezoelectric transducers.

Module – III

Display devices - LED, LCD and Electro Phoretic Image Display

Regulated power supplies using linear ICs - regulator ICs 723, 78XX, 79XX, 317.Switching regulator IC 7840, Isolation amplifier using Opto-coupler. Voltage controlled oscillator, PLL IC 565 and its applications.

Programmable logic controllers: basic structure-operation-Fundamentals of ladder programming.

Module – IV

Data converters - Digital to analog converter - ladder networks - settling time of DAC

Analog to digital converters - successive approximation, dual slope and simultaneous converters, conversion time. Sigma Delta Converters. Resolution, quantization error, gain error and linearity error of ADCs.

Digital multimeters - resolution in digital meters. Digital measurement of frequency, phase angle, time interval. Principle of electronic energy meter IC. Digital storage oscilloscope - principle - block schematic, sampling and storage. Data acquisition systems - block diagram, signal conditioning, sampling rate, sample and hold, analog multiplexing.

References:

1. Johnson C. D., *Process Control Instrumentation Technology*, PHI Learning, 2011.
2. Patranabis D., *Sensors and Transducers*, 2/e, PHI Learning, 2003.
3. Arney R. P. and J. G. Webster, *Sensors and Signal Conditioning,* 2/e, Wiley India, 2013.
4. Choudhary D. R. and S. B. Jain, *Linear Integrated Circuits*, 3/e, New Age International, 2008.
5. Hellfrick A. D. and W. Cooper, *Modern Electronic Instrumentation & Measurments Techniques*, Prentice Hall of India, 1992.
6. Murthy, D. V. S., *Transducers and Instrumentation*, PHI Learning, 2010.
7. Morris A. S., *Principles of Measurement and Instrumentation*, PHI Learning, 1993.
8. Kalsi H. S., *Electronic Instrumentation*, Tata McGraw Hill, 2012.
9. Rajput R. K., *Electronic Measurements and Instrumentation*, S. Chand, 2008
10. Rangan.C. S, G. R. Sarma and V. S. V. Mani, *Instrumentation Devices and Systems* Tata McGraw Hill, 2013.
11. Gaykward R. S., *Op-Amps and Linear Integrated Circuits*, PHI Learning, 2009.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

At the end of this course, the students will be able to choose appropriate transducers and design necessary signal conditioning circuits for a given process instrumentation system.

13.506.1 ENGINEERING MATERIALS SCIENCE (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

The objective of this course is to give a good foundation about the science of most of the materials used in the field of electrical engineering and also to give a thorough knowledge of dielectrics and its breakdown, magnetic and conductive properties of materials and their applications.

Module – I

Gaseous dielectrics: Types of collision- Elastic and in-elastic collisions. lonisation and decay process-ionisation by electron collision, Townsend's first ionization coefficient. photo-ionisation, ionisation by metastables, electron detachment, decay by recombination, decay by attachment-decay by diffusion.

Cathode process: Photo electric emission, electron emission by positive ions and excited atom impact, field emission, Townsend's second ionization coefficient.

Electric breakdown in gases: Townsend's criterion for breakdown, the sparking potential, Paschen's law - effect of space charge, the Streamer mechanism, breakdown voltage characteristics in uniform field, penning effect, surge breakdown voltage, time lag, statistical and formative time lags.

Module – II

Electro-negative gases: Production, properties and application of SF6 gas, high voltage breakdown and

arc phenomenon in SF6 and its mixtures with nitrogen. Breakdown in high vacuum, application of vacuum insulation.

Corona discharge: Negative point-plane corona, Trichel pulses, positive point corona.

Liquid dielectrics: Conduction and breakdown in pure liquids and commercial liquids, suspended particle theory, cavitation and bubble theory, thermal breakdown, stressed oil volume theory, treatment and testing of transformer oil, properties of transformer oil and synthetic oil used in transformers.

Module – III

Solid dielectrics: Classification based on temperature, breakdown in solid dielectrics, intrinsic breakdown, electro-mechanical breakdown - breakdown by treeing and tracking. Thermal breakdown, electro-chemical breakdown, cavity breakdown, internal partial

discharges - a b c equivalent circuit, degradation of capacitor insulation by partial discharges. Properties of polyethylene and cross-linking polyethylene and polypropylene films. Properties and applications of paper, rubber, plastic, wood, mica, ceramic and glass as dielectric materials.

Elementary idea of life of insulation: Exponential and inverse power law models, constant stress test, accelerated life test methods.

Module – IV

Magnetic materials: Dia, para, ferro, antiferro and ferri magnetism, magnetic anisotropy, magnetostriction. B-H curve, reversible and irreversible regions, hysteresis loop for soft and hard magnetic materials, annealing, properties of grain oriented silicon steel. Properties and application of iron, alloys of iron, and harden alloys

Materials for resistors: Properties of copper, aluminium and its alloys, silver, gold, Nickel, Molybdenum and Tungsten. Non-linear resistors: Thyrite and ZnO.

Semi-conductor materials: Classification - properties and applications of silicon, germanium, diamond, graphite, selenium, silicon carbide, gallium arsenide, indium, antimonide, gallium phosphide, cadmium compounds as semi conducting materials, merits of semiconductor materials for use in electrical engineering.

Superconductivity: Superconducting elements and compounds, Soft & hard superconductors, applications of superconductivity.

References:-

1. Nasser E., *Fundamentals of Gaseous Ionization and Plasma Electronics*, Wiley Series in Plasma Physics, 1971.
2. Dissado L. A. and J. C. Fothergill*, Electrical Degradation and Breakdown in Polymers*, Peregrinus, 1992.
3. Naidu M. S. and V. Kamaraju, *High Voltage Engineering*, Tata McGraw Hill, 2004.
4. Naidu M. S. and V. N. Maller, *SF6 and Vacuum Insulation for High Voltage Applications*, Khanna Publishers, 1977.
5. Dekker A. J., *Electrical Engineering Materials*, Prentice Hall of India, 2007.
6. Indulkar C. S. and S. Thiruvenkidem, Electrical Engineering Materials, S. Chand & Co., 2012.
7. Tareev B., *Physics of Dielectric Materials*, MIR Publishers, 1975.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the successful completion of this course, the students will be able to select the proper insulating/ /semiconducting /conducting /superconducting/magnetic material for applications in electrical engineering.

13.506.2 OPERATIONS RESEARCH (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

This course is intended to provide the knowledge of OR tools and to apply the skill in the design, analysis, operation and control of complex electrical systems.

Prerequisite- Concepts of linear programming problems.

Module – I

Definition of Operations Research(OR), Modeling in OR, general methods of solving OR models, Scientific methods in OR. Mathematical formulations of Linear Programming Problems. Review of various solution techniques of LPP. Artificial variables - duality, dual simplex, degeneracy and elementary sensitivity analysis (theory only). Dynamic Programming- Applications in engineering fields.

Module – II

The transportation problem, mathematical formulation, Solution, degeneracy, unbalanced transportation problem. Case studies.

Assignment problem, mathematical formulation, the assignment algorithm, – The Hungarian Method- unbalanced assignment problems .Case studies

Decision theory – decision under risk – expected value of profit or loss, expected variance criterion, decision trees, decisions under uncertainty – the Laplace criterion, the mini-max criterion, minimax regret criterion, Hurwicz criterion.

Module – III

Replacement model, types of replacement problem, problem of choosing between two machines, determination of best replacement age of machine using present worth and discount rate, group replacement. Game theory – definition of a game, pay-off, two person zero sum game, graphical solution, application in marketing, advertisement etc. Inventory problems, the economic lot size system, Newspaper boy problem, purchase, inventory model with price breaks. Case studies.

Module – IV

Network analysis, project scheduling by PERT – CPM, Arrow head representation, calculation of critical path, probability and cost consideration in project scheduling- Case studies. Construction of the time chart-resource leveling, Queuing theory, basic elements of the queuing model problems connecting (m/m/I) and (m/m/k) – Problems – various applications in commercial and engineering fields.

References:-

1. Goel B. S. and S. K. Mittal, *Operations Research*, S Chand, 2007.
2. Hiller F. S. and G. J. Lieberman, *Operations Research*, CBS Publishers, Delhi, 1990.
3. Taha H. A., *Operation Research – An Introduction*, 7/e, Person Education / Prentice Hall of India Edition, 2002.
4. Gupta P. K. and D. S. Hira, *Operations Research*, S. Chand, 2012.
5. Rardin R. L., *Optimization in Operation Research*, Pearson Education, 2002.
6. Hillier F.S. and G. J. Lieberman, *Introduction to Operation Research*, 7/e, McGraw Hill, 2001.
7. Panneer Selvam R., *Operations Research*, Prentice Hall of India, 2002.
8. Tulsin P. C., *Quantitative Technique : Theory and Problem*, Pearson Education, 2002.
9. Ravindran, Phillips and Solberg, *Operation Research Principles and Practice*, 2/e, John Wiley & Sons, 1987.
10. Srinivasn, *Operations Research: Principles and Applications*, Prentice Hall of India, 2007.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the students will be able to design and schedule a process in an optimal way. The students will also be able to take proper decisions to operate a system in the most efficient manner.

13.506.3 SUSTAINABLE DEVELOPMENT (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

To introduce the concept of sustainable development, providing a sound basis in the subject, which will help in creating a sustainable society.

Module – I

Understanding Sustainable Development: Definitions and perspectives. Introduction to Sustainable development-Economic growth and progress-Continuing poverty- Environmental threats hitting the rich and poor alike-The business as usual path versus the sustainable development path. The UN framework for sustainable development.

Economic Development – Measuring and its variation around the world: – Incomes around the World - Urban/rural inequality - Income inequality within countries - Measuring well-being (Happiness) – Reasons for extreme poverty and the Global poverty profile.

Module – II

The Millenium Development Goals.

Growth within Planetary Boundaries: The Planetary Boundaries – The Science of Planetary Boundaries- Growth Dynamics – Growth and Planetary Boundaries: The Case of Energy, Food and Population – Climate change.

Human Rights and Gender Equality: The Ethics of Wealth, Poverty, and Inequality - Major UN Covenants and Declarations – Divided societies – Forces of Widening Inequalities – Gender Inequality and Solutions.

Module – III

Education : Life-cycle approach to human development – Early Childhood Development – Social mobility – The role of higher education in sustainable development – Relation to sustainable development.

Universal Health Coverage: The human right to health – Poverty and disease – Ten Recommended Steps to Health for All in the Poorest Countries

Sustainable Food Supply: Malnutrition – Farm systems, ecology, and food security – How environmental change threatens the food system – How the food system threatens the environment – Towards a sustainable global food supply.

Module – IV

Sustainable Cities: The patterns of urbanization around the world – Factors which make a city sustainable – Smart Infrastructure – Urban Resilience – Planning for Sustainable

Development

Biodiversity: Biodiversity – Biodiversity under threat – Oceans and fisheries – Deforestation

The Sustainable Development Goals (SDG): The proposal for SDGs at Rio+20 – Illustrative SDGs – Goal-Based Development – Financing for Sustainable Development – Principles of Good Governance.

References:-

Module I:

1. Draft Framework for Sustainable Development, UN Sustainable Development Solutions Network (22 pages) Available at: *http://unsdsn.org/wp-content/uploads/2014/02/121220-Draft-Framework-of-Sustainable-Development1 .pdf*
2. Executive Summary of A New Global Partnership: Eradicate Poverty and Transform Economies Through Sustainable Development, The Secretary General's High Level Panel of Eminent Persons on the Post-2015 Development Agenda (3 pages) *http://www.post2015hlp.org/wp-content/uploads/2013/05/UN-Report.pdf*
3. A life of dignity for all: accelerating progress towards the Millennium Development Goals and advancing the United Nations development agenda beyond 2015, Report of the UN Secretary General (19 pages) *http://www.un.org/millenniumgoals/ pdf/A%20Life%20of%20Dignity%20for%20All.pdf*
4. Executive Summary of An Action Agenda for Sustainable Development, UN Sustainable Development Solutions Network (3 pages) *http://unsdsn.org/ files/2013/11/An-Action-Agenda-for-Sustainable-Development.pdf*
5. Global Profile of Extreme Poverty and Hunger, UN Sustainable Development Solutions Network *http://unsdsn.org/wp-content/uploads/2014/02/121015-Profile-of-Extreme-Poverty.pdf*
6. Helliwell, John, Richard Layard and Jeffrey D. Sachs, **World Happiness Report** 2013. *http://unsdsn.org/resources/publications/world-happiness-report-2013/*

Module II:

7. United Nations Millennium Declaration (9 pages) *http://www.un.org /millennium/declaration/ares552e.pdf*
8. Sustainable Development and Planetary Boundaries by Johan Rockstrom et al. (22 pages) *http://www.post2015hlp.org/wp-content/uploads/2013/06/Rockstroem-Sachs-Oehman-Schmidt-Traub_Sustainable-Development-and-Planetary-Boundaries.pdf*
9. Rockstrom, Johan. A safe operating space for humanity, Nature, Vol 461, 24 September 2009, pp 462- 475 Available at: *https://d396qusza40orc. cloudfront.net/susdev%2FA_safe_operating_space_for_humanity_Rockstrom_2009.p df*
10. Climate Change: Evidence and Causes available at https://d396qusza40orc. cloudfront .net/susdev%2FNAS%20RS%20climate-change-evidence-causes.pdf

11. Universal Declaration of Human Rights, *http://www.un.org/en/documents /udhr/ index.shtml*
12. United Nations Millennium Declaration *http://www.un.org/millennium/declaration/ ares552e.htm*
13. Social Inclusion & Human Rights: Implications for 2030 and Beyond, Background paper for the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda (6 pages) *http://unsdsn.org/wp-content/uploads/2014/02/130114-Social-Exclusion-and-Human-Rights-Paper-for-HLP.pdf*
14. Taking Action: Achieving Gender Equality and Empowering Women, UN Millennium Project Task Force on Gender Equality. Executive Summary (26 pages) *http://www. unmillenniumproject.org/documents/Gender-frontmatter.pdf*
15. Addressing inequalities: The heart of the post-2015 agenda and the future we want for all, UN System Task Team on the Post-2015 Development Agenda (15 pages) *http://www.un.org/en/development/desa/policy/untaskteam_undf/thinkpieces/10_inequalities.pdf*

Module III:

16. Sachs, Jeffrey D. The Lost Generations, Project Syndicate *http://www.project-syndicate.org/commentary/education--nutrition--and-health-care-are-the-best-investments-by-jeffrey-d--sachs*
17. Education and skills for inclusive and sustainable development beyond 2015, UN System Task Team on the Post-2015 Development Agenda (16 pages) *http://www. un.org/en/development/desa/policy/untaskteam_undf/thinkpieces/4_education.pdf*
18. International Commission on Education for Sustainable Development Practice Final Report, Executive Summary (10 pages) *http://globalmdp.org/sites /ei.civicactions .net/files/InternationalCommissionReport.pdf*
19. Education for All: Global Monitoring Report, Summary (46 pages) *http://unesdoc. unesco.org/images/0021/002175/217509E.pdf*
20. Investing in Health for Economic Development, Report of the Commission on Macroeconomics and Health. Executive Summary (20 pages) *http://whqlibdoc. who.int/publications/2001/924154550x.pdf*
21. One Million Community Health Worker Fact Sheet *http://1millionhealthworkers. org/files /2013/01/CHW_FactSheet_Final.pdf*
22. Health in the Post-2015 Development Agenda, UN Task Team on the Post-2015 Development Agenda (15 pages) *http://www.un.org/en/development/desa /policy/untaskteam_undf/thinkpieces/8_health.pdf*
23. Health in the Framework of Sustainable Development, *http://unsdsn.org/resources publications/health-in-the-framework-of-sustainable-development/*
24. Halving Hunger: It Can Be Done, UN Millennium Project Hunger Task Force. Summary Report (30 pages) *http://www.unmillenniumproject.org/documents/HTF-SumVers_FINAL.pdf*
25. Opportunities and Solutions for Sustainable Food Production, UN Sustainable

Development Solutions Network Thematic Group on Sustainable Agriculture and Food Systems (24 pages) *http://unsdsn.org/wp-content/uploads/2014/02/130112-HLP-TG7-Solutions-for-sustainable-food-production.pdf*

Module IV:

26. The Urban Opportunity: Enabling Transformative and Sustainable Development, UN Sustainable Development Solutions Network Thematic Group on Sustainable Cities (40 pages) *http://sustainabledevelopment.un.org/content/documents/2579Final-052013-SDSN-TG09-The-Urban-Opportunity.pdf*
27. Sustainable Urbanization, UN Task Team on the Post-2015 Development Agenda (11 pages)*http://www.un.org/en/development/desa/policy/untaskteam_undf/thinkpieces/18_urbanization.pdf*
28. Summary for Policymakers, Intergovernmental Panel on Climate Change (17 pages) *http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf*
29. Stern Review: The Economics of Climate Change, Executive Summary (27 pages) *http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/media/4/3/Executive_Summary.pdf*
30. Sachs, Jeffrey D. and Guido Schmidt-Traub. Financing for development and climate change post-2015 (16 pages) *http://unsdsn.org/wp-content/uploads /2014/02/130316 -Development-and-Climate-Finance.pdf*
31. Summary for Decision Makers: Ecosystems and Human Well Being, Synthesis, Millennium Ecosystem Assessment (24 pages) *http://www.unep.org/maweb/documents/document.356.aspx.pdf*
32. Global Biodiversity Outlook 3, Convention on Biological Diversity. Executive Summary and Introduction (8 pages) *http://www.cbd.int/doc/publications/gbo/gbo3 -final-en.pdf*
33. The Economics of Desertification, Land Degradation and Drought: Methodologies and Analysis for Decision-Making, 2nd Scientific Conference on the UNCCD; Executive Summary; Chapter 1: Introduction; Chapter 2: Economic and social impacts of desertification, land degradation and drought; Chapter 5: Implementation of the Rio conventions – a call for synergies to advance the economics of desertification, land degradation and drought; Chapter 6: Using the Economics of desertification, land degradation and drought to inform policies at local, national and international level; Conclusion (26 pages) *http://2sc.unccd.int/fileadmin/unccd/upload/documents/Background_documents/Background_Document_web3*.
34. A New Global Partnership: Eradicate Poverty and Transform Economies Through Sustainable Development, The Secretary General's High Level Panel of Eminent Persons on the Post-2015 Development Agenda *http://www.post2015hlp.org/wp-content/uploads/2013/05/UN-Report.pdf*
35. The Open Working Group on Sustainable Development Goals Interim Report *http://www.un.org/ga/search/view_doc.asp?symbol=A/67/941&Lang=E*

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

Upon successful completion of this course, students will be able to create a society that is sustainable to the environmental changes.

13.506.4 NEW AND RENEWABLE SOURCES OF ENERGY (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

Subject is intended to give an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology and application. Energy conservation methods will also be emphasized.

Module – I

ENERGY SOURCES: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario.

ENERGY STORAGE: Introduction, Necessity of Energy Storage, and Methods of Energy Storage (classification and brief description using block diagram representation only).

Module – II

SOLAR THERMAL SYSTEMS: Introduction, Solar Constant, Basic Sun-Earth Angles, Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer .Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses.

SOLAR ELECTRIC SYSTEMS: Solar Thermal Electric Power Generation – Solar Pond and concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-alone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems.

Module – III

ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Advantages and Limitations of TPP.

Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC.

WIND ENERGY: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Advantages and Disadvantages of WECS..

Module – IV

BIOMASS ENERGY: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KVIC and Janata model; Biomass program in India.

Small hydro power: Classification as micro, mini and small hydro projects - Basic concepts and types of turbines - Design and selection considerations.

EMERGING TECHNOLOGIES: Fuel Cell, Small Hydro Resources, Hydrogen Energy, alcohol energy, nuclear fusion and power from satellite stations.

References:-

1. Rai G. D., *Non-Conventional Sources of Energy*, 4/e, Khanna Publishers, 2007
2. Sawhney G. S., *Non-Conventional Energy Resources,* PHI Learning, 2012.
3. Khan B. H., *Non-Conventional Energy Resources,* Tata McGraw Hill, 2009.
4. Twidell J. W. and A. D. Weir, *Renewable Energy Resources,* ELBS, 1996.
5. Earnest J. and T. Wizelius, *Wind Power Plants and Project Development*, PHI Learning, 2011.
6. Tester J. W., E. M. Drake, M. W. Golay, M. J. Driscoll and W. A. Peters, *Sustainable Energy - Choosing Among options*, The MIT Press, 2005.
7. Tiwari G. N., *Solar Energy- Fundamentals, Design*, *Modelling and Applications*, CRC Press, 2002.
8. Johansson T. B., H. Kelly, A. K. N. Reddy and R. H. Williams, *Renewable Energy – Sources for Fuel and Electricity*, Earthscan Publications, London, 1993.
9. Boyle G. (ed.), *Renewable Energy - Power for Sustainable Future,* Oxford University Press, 1996.
10. Abbasi S. A. and N. Abbasi, *Renewable Energy Sources and Their Environmental Impact*, Prentice Hall of India, 2001.
11. Rai G. D., *Solar energy utilization*-Khanna Publishers, 2000.
12. Sab S. L., *Renewable and Novel Energy Sources*, MI. Publications, 1995.
13. Rao S. and B. B. Parulekar, *Energy Technology*, Khanna Publishers, 1999.
14. Sutton G., *Direct Energy Conversions*, McGraw Hill, New York, 1966.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the successful competition of this course the students will be able to choose an appropriate alternate energy source for power applications.

13.506.5 DISASTER MANAGEMENT (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

To provide an understanding and an awareness of the principles and practices of disaster management and the tools available for a disaster manager. Also to introduce the principal disaster management technologies with which a disaster manager should be familiar.

Module – I

Introduction – Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management –Alternative to dominant approach – disaster-development linkages -Principle of risk partnership.

Module – II

Application of various technologies: Data bases – RDBMS – Management Information systems – Decision support system and other systems – Geographic information systems – Intranets and extranets – video teleconferencing. Trigger mechanism – Remote sensing-an insight – contribution of remote sensing and GIS - Case study.

Module – III

AWARENESS OF RISK REDUCTION: Trigger mechanism – constitution of trigger mechanism – risk reduction by education –disaster information network – risk reduction by public awareness

DEVELOPMENT PLANNING ON DISASTER: Implication of development planning – financial arrangements – areas of improvement –disaster preparedness – community based disaster management – emergency response.

Module – IV

SEISMICITY: Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and Intensity – ground damage – Tsunamis and earthquakes

References:-

1. Sahni P., M. Malalgoda and Ariyabandu, *Disaster Risk Reduction in South Asia*, PHI Learning, 2003.
2. Sinvhal A., *Understanding Earthquake Disasters*, Tata McGraw Hill, 2010.

3. Sahni P., A. Dhameja and U. Medury, *Disaster Mitigation: Experiences and Reflections*, PHI Learning, 2001.
4. *http://epdfiles.engr.wisc.edu/dmcweb/AA02 Aim and Scope of Disaster Management. pdf*.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

Students will be able to discuss issues of disaster management in a clear, concise, and easily understandable manner with the general public, mass media outlets, and government officials. Students will also be able to implement, effective means to plan, mitigate, respond, and recover from disasters and emergencies, natural and man-made.

13.506.6 COMPUTER ORGANISATION (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

Module – I

Basic Operational concepts - Von-Neumann architecture, Bus structure - monobus and multibus structures, memory locations and addresses, Addressing methods. Instruction formats - Instruction sequencing.

Processing unit - fundamental concepts - single bus organization of CPU - multiple bus organization of CPU, memory read and memory write operations - Data transfer using registers. Execution of a complete instruction -sequencing of control signals.

Module – II

Computer Arithmetic - Constructing an arithmetic logic unit - A 32 bit ALU, Basic Operations - Signed and unsigned addition - carry look ahead adder, subtraction, Multiplication algorithm - Booths algorithm, Division algorithm.

Control unit - Hardwired control and micro-programmed control - grouping of control signals – microinstruction with next field address - Pre-fetching of microinstructions - Emulation.

Module – III

Input/output organisation- Accessing input/output devices, Organization of interrupts - vectored interrupts –

Setting of priorities – Interrupt masking - Servicing of multiple input/output devices - Polling and daisy chaining schemes. Direct memory accessing (DMA).

I/O channels (introduction only). I/O interfacing - Interfacing I/O devices to memory, processor and operating systems. Bus standards – IEEE standards – SCSI, PCI, USB.

Module – IV

Main memory unit - Memory organisation - memory cells – static memory-dynamic memories -multiple module memory - Memory interleaving - Cache memory - principles - elements of cache design - mapping function -associate mapping - set associative mapping - fully associative mapping - aging.

Advanced computer architecture - Organisation of multi-user computer system. Principles of RISC machines -Overview of parallel processor, multiprocessor and bit-slice architecture. Pipelining, Overview of data-flow architecture

References:-

1. Hamacher V. C., *Computer Organisation*, 5/e, McGraw Hill, 2002.
2. Hennessy J. L. and D. A. Patterson, *Computer Organisation and design,* 4/e, Harcourt Asia Pvt. Ltd., 2000.
3. Stallings W., Computer Organisation and Architecture: Designing for Performance, 7/e, Pearson, 2008.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the successful completion of this course, the students will be able to do the:

- *Implementation of the different types of control and the concept of pipelining.*
- *Implementation of hierarchical memory system including cache memories.*

13.506.7 PROFESSIONAL COMMUNICATION (E)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

To understand how communication works and to manage the assumptions more effectively. To help the students to communicate effectively, appropriately and clearly in all situations.

Module – I

Vocabulary and Functional English: This area attempts at making learners withstand the competition at the transnational technical environment so as to enable them to undertake various professional operations.

1. Vocabulary – a basic word list of one thousand words.
2. Functional grammar, with special focus on common errors in English.
3. Idioms and phrasal verbs.

(Only a brief review of the above topic is required)

Listening, Speaking and Reading:

This area exposes the learners to the standard expressions including stress, rhythm and various aspects of isolated elements and connected speech. The use of diphthongs, elements of spoken expression, varieties of English and accent neutralization

Listening Skills: Listening for general content, Intensive listening, listening for specific information. Sounds, stress, intonation, question tag, listening to lectures, audio/video cassettes, asking and answering questions, note-taking, dialogue-writing.

Speaking Skills: Oral practice: Describing objects/situations/people-Role play-(Individual and group activities), Just A Minute (JAM)/Group Discussion.

Reading Comprehension: This area exposes the learners to the techniques deciphering and analyzing longer texts pertaining to various disciplines of study. Types of Reading, Sub skills of Reading, Eye span – fixation, Reading Aloud and Silent Reading, Vertical and Horizontal Reading, Vocalization and sub-vocalization.

Reading Skills: Skimming the text- exposure to a variety of technical articles, essays, graphic representation, and journalistic articles.

Module – II

Written Communication Skills: This area exposes the learners to the basic tenets of writing; the style and format of different tools of written communication. Description (through

Paragraph Writing), Reflection (through Essay Writing), Persuasion(through indented Letter Writing), Skills to express ideas in sentences, use of appropriate vocabulary -sentence construction-paragraphs development-note making, informal letters, essentials of telephonic conversation, invitations, minutes of a meeting, editing a passage and essay writing.

Module – III

Technical communication skills : Technical Report Writing (Informational, Analytical and Special reports), Technical Vocabulary, Technical communication- features, distinction between general and technical communication, language as a tool of communication: levels of communication, interpersonal, organizational, mass communication, the flow of communication: upward, downward and lateral, importance of technical communication, barriers to communication.

Technical English for specific purposes (ESP): Business letters-sales and credit letters, letter of enquiry, letter of quotation, placing order. Job application and resume. Official letters, government letters, letter to authorities. Reports-types, significance, structure and style, writing reports, condensing .Technical proposals-writing a proposal –the steps involved. Technical papers- projects- dissertation- thesis writing. Preparing audio-visual aids.

Module – IV

A non-detailed study of the autobiography: Wings of Fire-An Autobiography by APJ Abdul Kalam.*Students should read the book on their own and selected topics may be discussed in the* class

References:-

1. Rutherford A. J., *Basic Communication Skills for Technology, Pearson* Education, 2006.
2. Mohan K. and R. C. Sharma, *Business Correspondence and Report Writing*, Tata McGraw Hill, 2002.
3. Mitra B. K., *Effective Technical Communication,* Oxford University Press, New Delhi, 2006.
4. Dixson R. J., *Everyday Dialogues in English*, Prentice Hall of India.
5. Laksminarayanan K. R., *English for Technical Communication,* Vol. I and II, SciTech Publications, 2007.
6. Abdul Kalam A. P. J., *Wings of Fire-An autobiography, Universities* Press, 2004.
7. Quirk R., *The Use of English,* Pearson Education, 1962.

8. Thomson A. J. and A. V. Martinet, *Practical English Grammar*, 4/e, Oxford University Press, 1986.
9. Berry T. E., *Most Common Mistakes in English Usage*, McGraw Hill, 1971.
10. Sarma B. S., *Structural Patterns and Usage in English*, Poosha Series, 2007.
11. Langan J., *College Writing Skills*, Tata McGraw Hill, 2001.
12. Trimble L., *English for Science and Technology: A Discourse Approach,* Cambridge University Press, 1985.
13. Gartside J., *Business Communication,* ELBS, 1991.
14. Sethi J. and P.V. Dhamija, *A Course in Phonetics and Spoken English*, Prentice Hall, 2004.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

On completing this course, students will be able to listen, understand, read and write English for effective communication and manage their profession.

13.507 POWER ELECTRONICS LAB (E)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 4

Course Objective :

This course will enable the students to get practical knowledge in the design and implementation of power electronics circuits.

List of Experiments:

1. Study of Power devices- SCR, TRIAC, Power MOSFET, IGBT, etc.
2. Static VI characteristics of SCR
3. Characteristics of Power MOSFET.
4. Characteristics of IGBT
5. *Phase control circuit using R and RC triggering.
6. *UJT trigger circuit for single phase controlled rectifier.
7. *AC voltage controller using Triac.
8. *Study of PLL IC - Determination of lock in range and capture range.
9. *Ramp Control trigger circuit
10. *Digital trigger circuit.
11. Single phase fully controlled SCR bridge circuit.
12. Pushpull inverter circuit using MOSFET
13. Study of motor control using controlled rectifier
14. Design and testing of step-down and step-up chopper using IC78S40 or equivalent.

*Design of the triggering circuit is part of the experiment

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test

40% - Class work and Record

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions based on the list of experiments prescribed

80% - Circuit and design (30%);

Performance (30%)

Results and inference (20%)

20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

After successful completion of this course, students will be able to design and implement converter/inverter/chopper circuits for power applications.

13.408 MEASUREMENTS AND INSTRUMENTATION LAB (E)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 4

Course Objective :

To expose the students to the testing of various measuring instruments and a variety of process instrumentation systems.

List of Experiments:

1. Design and Testing of Summer, Integrator and Differentiator Circuits
2. Determination of Power and Power factor of a given single phase circuit using dynamometer watt meter and power factor meter
3. Determination of BH characteristics
4. Extension of range of voltmeter and Ammeter using-Wheatstone Bridge and Kelvin's Double Bridge.
5. Measurement of self inductance, mutual inductance and coupling coefficient
6. Calibration of meters and extension of range using slide-wire potentiometer
7. Calibration of three-phase Energy meter by phantom loading.
8. Calibration of wattmeter using Vernier dial potentiometer
9. Extension of instrument range by using Instrument transformers(CT and PT)
10. Design of Schmitt Trigger (Both symmetrical & Unsymmetrical)
11. Characteristics of Thermistor, RTD, Thermocouple
12. Characteristics of LVDT.
13. Characteristics of strain gauge/ Load cell.

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions based on the list of experiments prescribed

80% - Circuit and design (30%); Performance (30%); Results and inference (20%)

20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

After successful completion of this course, students will be able to select a suitable instrument, with minimum error, for measurement purpose and to choose a proper transducer for instrumentation systems.