SANT GADGE BABA AMRAVATI UNIVERSITY

(Faculty of Engineering & Technology)

PROSPECTUS
Prescribed for
Four / Five Year Degree Course
Bachelor of Engineering Sem-VII, VIII
/ Bachelor of Architecture Sem-VII-X
(CREDIT GRADE SYSTEM)

BRANCHES
1) Civil Engineering
2) Mechanical Engineering
3) Electrical Engineering (Electronics & Power)
4) Electrical and Electronics Engineering
5) Electrical Engineering (Electrical & Power)
6) Electrical Engineering
7) Architecture
8) Information technology
9) Information technology
10) Biomedical Engineering

2013
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Price Rs. .........../-
SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

- Ordinance No. 1 : Enrolment of Students.
- Ordinance No. 2 : Admission of Students
- Ordinance No. 4 : National cadet corps
- Ordinance No. 6 : Examinations in General (relevant extracts)
- Ordinance No. 18/2001 : An Ordinance to provide grace marks for passing in a Head of passing and Improvement of Division (Higher Class) and getting Distinction in the subject and condonation of deficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
- Ordinance No. 9 : Conduct of Examinations (relevant extracts)
- Ordinance No. 10 : Providing for Exemptions and Compartments
- Ordinance No. 19 : Admission of Candidates to Degrees.

- Ordinance No. 109 : Recording of a change of name of a University student in the records of the University.
- Ordinance No. 5/2010 : For improvement of Division/Grade.
- Ordinance No.19/2001 : An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be broadly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.
Subject :- Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology.

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No.39 accepted and recommended schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon’ble Vice Chancellor u/s Section 14(7) of M.U.Act, 1994 on behalf of Academic Council on 9th April, 2011,

AND

Whereas these schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as per Credit Grade System in the faculty of Engineering & Technology are to be implemented from the academic session 2011-2012,

AND

Whereas syllabi of various branches in the faculty of Engineering & Technology are to be sent for printing,

Now, therefore, I, Dr. Mohan K. Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act,1994 hereby direct as under :-

1) This Direction shall be called "Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology, Direction, 2011".

2) This Direction shall come into force from the date of its issuance.

3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

**BRANCH**

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<tr>
<th>Appendix No.</th>
<th>Branch</th>
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<td>Chemical Technology (Food, Pulp &amp; Paper, Oil &amp; Paint and Petrochemical Technology)</td>
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<td>Information Technology</td>
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<td>S</td>
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sd/-

Dr. Mohan K. Khedkar
Vice Chancellor

*******
### FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
### BRANCH: CIVIL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

#### SEMESTER - SEVENTH

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### SEMESTER : EIGHTH

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### Professional Elective-I
- Advanced Water Treatment
- Advanced Geotechnical Engineering
- Water Power Engineering
- Prestressed Concrete
- Artificial Neural Network & Fuzzy Logic
- Advanced Concrete Technology
- Environmental Pollution & Rural Sanitation
- Advanced Earthquake Engineering

### Professional Elective-II
- Advanced Design of Steel Structures
- Advanced Waste Water and Industrial Waste Treatment
- Finite Element Method
- Dam Engineering
- Advanced Engineering Geology
- Matrix Computer Analysis of Structures
- Advanced Structural Analysis
- Rock Mechanics
- Advanced Design of RCC Structures

*PAPER 4 HOURS DURATION.*
### FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

**BRANCH - MECHANICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)**

#### SEMESTER - SEVENTH

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**Total Credits: 500**

**GRAND TOTAL: 700**

Professional Elective I: (1) Non-Conventional Energy System (2) Tool Engineering (3) Artificial Intelligence & Expert Systems (4) Mechatronics

#### SEMESTER - EIGHTH

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**Total Credits: 400**

**GRAND TOTAL: 700**

Professional Elective-II: (1) Automobile Engineering (2) Production Planning & Control (3) Management Information Systems (4) Advanced Manufacturing Systems

Professional Elective-III: (1) Refrigeration & Air Conditioning (2) Machine Tool Design (3) Plastic Element Methods (4) Robotics
# FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: ELECTRICAL ENGINEERING (ELECTRONICS & POWER) - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

## SEMESTER - SEVENTH

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### PRACTICALS / DRAWING / DESIGN

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## SEMESTER - EIGHT

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TOTAL 600
### Four Year Degree Course in Bachelor of Engineering

**Branch: Electrical & Electronics Engineering - Semester Pattern (Credit Grade System)**

#### Appendix - D

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#### TOTAL

In **Semester Seventh**, a total of 700 credits are covered in the following subjects:
- Theory: 300 credits
- Practical/Design: 400 credits

In **Semester Eighth**, a total of 600 credits are covered in the following subjects:
- Theory: 300 credits
- Practical/Design: 300 credits

---


** Professional Elective - II 1) Power System Management 2) Fuzzy Logic & Control 3) RPC & Facts Controller 4) Power Quality
## FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
### BRANCH - ELECTRICAL ENGINEERING (ELECTRICAL & POWER)- SEMESTER PATTERN (CREDIT GRADE SYSTEM)

### Appendix - E

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FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: ELECTRICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

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** Total 650


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TOTAL 14 8 20 20

** Total 600

## FIVE YEAR DEGREE COURSE IN BRANCH OF ARCHITECTURE
### SEMESTER PATTERN (CREDIT GRADE SYSTEM)

**Appendix - G**

### SEMESTER - SEVENTH

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**Sessional / Practical**

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**EXAMINATION SCHEME**

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Note: Consider one hour Lecture / Tutorial and P/D is equal to one credit for the subjects of Architectural Design and for all other subjects consider 1 hour Lecture & Tutorial = 1 credit & 2 hours Practical / Design studio = 1 credit.

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Note: Consider one hour Lecture / Tutorial and P/D is equal to one credit for the subjects of Architectural Design and for all other subjects consider 1 hour Lecture & Tutorial = 1 credit & 2 hours Practical / Design studio = 1 credit.

1. Professional Lecture: 1) Housing 2) Environmental Planning 3) Construction Management
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Practical Training shall be for six month in architectural firms approved by the institutions

## SEMESTER: TENTH

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Total 500

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Total 300

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Total 300
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**TOTAL 20** | **8** | **28** | **70**

**Total: 700**

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### Professional Elective I° (i) Distributed DSMS (ii) Modelling & Simulation (iii) Artificial Intelligence & Expert Systems (iv) Multimedia Technologies

#### Semester : Eighth

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**TOTAL 12** | **24** | **27**  

**Total: 700**

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### Professional Elective II° (i) Data Warehousing & Data Mining (ii) Web-Commerce (iii) Cloud Computing (iv) Neural Networks & Fuzzy Logics
## Four Year Degree Course in Bachelor of Engineering

### Branch: Biomedical Engineering - Semester Pattern (Credit Grade System)

#### Appendix - I

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**THEORY**

- **7BM06**: Bio Signal Processing-Lab
- **7BM07**: Medical Expert Systems-Lab
- **7BM08**: Hospital Engineering & Management-Lab
- **7BM09**: Project and Seminar

**PRACTICALS / DRAWING / DESIGN**

- **7BM06**: Bio Signal Processing-Lab
- **7BM07**: Medical Expert Systems-Lab
- **7BM08**: Hospital Engineering & Management-Lab
- **7BM09**: Project and Seminar

**Semester: Eighth**

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**PRACTICALS / DRAWING / DESIGN**

- **8BM05**: Bio Medical Imaging Systems-Lab
- **8BM06**: Bio Medical Embedded System Design-Lab
- **8BM07**: Project and Seminar

**TOTAL**: 550
SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
CIVIL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER SEVEN

7CE01 THEORY OF STRUCTURES – II

SECTION – A

Unit-I: 1. Moment distribution method, application to portal frames with sway. Multibay, multistoried, symmetrical frames subjected to symmetric loads only.
2. Slope deflection method: Application to portal frames with side sway.

Unit-II: 1. Kani’s method: Continuous beams and single bay single storey portal frames with side sway.
2. Multi-bay, multi storeyed frames subjected to symmetric loads.

Unit-III: 1. Castigliano’s second theorem, principle of least work, Analysis of redundant frames. (up to two degree redundancy).
2. Analysis of redundant trusses (up to second degree of redundancy), lack of fit, temperature effect.

SECTION – B

Unit-IV: 1. Maxwell’s reciprocal theorem, Betty’s theorem, Muller - Breslau principle, Influence line diagrams for continuous beams, up to two span only.
2. Tension coefficient method & its applications to simple space trusses.

Unit-V: 1. Flexibility method, static redundancy, flexibility coefficients, compatibility condition application to beams.
2. Introduction to plastic analysis of steel structure, shape factor, plastic section modulus, Redistribution of moment, upper and lower bound theorems, collapse loads for beams, single bay, single storey portals.

Unit-VI: Stiffness method, kinematic redundancy, stiffness coefficients, direct stiffness approach, application to continuous beams and single - bay, single - storey portal.

BOOKS RECOMMENDED:
2. Jain and Arya, Theory and Analysis of Structures

4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural Analysis

7CE02 GEOTECHNICAL ENGINEERING – II

SECTION – A

Unit I: Exploratory Programme : Field exploration, objectives and methods of exploration planning of exploration programme soil boring, hand augers, percussion boring, rotary wash boring, collection of sample, split spoon sampler, area ratio, disturbed and undisturbed sample, SPT test, field vane shear test, geophysical methods, electrical resistivity and soil refraction methods. Soil log bore presentation and interpretation exploration data.

Unit II: Bearing Capacity of Shallow foundation :- Different theories: Terzaghi’s skempton’s, Meyerhof’s, BIS method for bearing capacity, determination bearing capacity of granular soils based on SPT value. concept of raft foundation and floating foundation. In situ methods of evaluation of bearing capacity, plate load test, static cone penetrometer, pressure meter test contact pressure distribution diagram below the base of footing.

Unit III: Earth pressure at rest, general & local Stages of plastic equilibrium, Rankine’s and coullomb’s theory of active and passive earth pressure on retaining wall. Influence of surcharge, water table, wall friction, Rebhan’s and culmann’s simple graphical methods Ground Improvement : methods of soil stabilization use of admixture (lime, cement, flyash) in stabilization) Mechanism of reinforced soil, use of Geo synthetics material as a reinforcement, vibroflotation, sand drain installation and preloading.

SECTION – B

Unit IV: Pile foundation : Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sandy and in clayey soil, dynamic pile formula Negative skin friction, factor affecting it, piles in groups and their capacity, group efficiency, factors affecting group efficiency, behavior of group of pile in sandy and in clayey soil, pile load test, effect of pile cap. Criteria for spacing and depth of piles. IS design criterion for undereamed Pile in clay and sands

Unit V: Settlement Evaluation of soils settlement : immediate, primary and secondary settlement for footing resting on homogenous isotropic, cohesive and cohesion less soils related to single footing, combined footing, raft foundation etc, standard for requirement of settlement,
7CE03  STRUCTURAL DESIGN –II

SECTION-A

(R.C.C. STRUCTURES BY LIMIT STATE METHOD)

Unit-I :  1. Design of interior panel of flat slab by direct design method.
         (Problem on square panel only)
         2. Design of cantilever retaining wall and Counterfort retaining wall.

Unit II :  1. Design of combined footing.
         2. Complete design of simple, small structures like Canopies & Parking shed.

SECTION - B

(PRESTRESSED CONCRETE)

Unit-III :  1. Introduction to Prestressed concrete: Materials and their characteristics, types of prestressing, Methods and various prestressing systems, Losses of prestress
         2. Analysis of beams for flexure, under working load for Rectangular and flanged sections.

Unit-IV :  1. Basic Design of rectangular sections for flexure by limit state method, Design of one way single span slabs.
         2. Design of prestressed concrete circular water tanks by IS code method.
         Students may be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:
1. Jain, A. K., Reinforced Concrete (Limit State Design)
2. Jaikrishna and Jain, Plain and Reinforced Concrete, Volume I and II
3. Sinham S. N., Reinforced Concrete (Limit State Design)
5. Lin, T. Y. and Burns N. H., Design of Prestressed Concrete Structures, John Wiley and Sons.
6. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi)
SECTION - B

Unit-IV: Filtration: Rapid sand and slow sand filters, filter media, Rate of filtration, under drainage system and washing process. Control system, Negative head, operating difficulties, pressure filter; Simple design problems on rapid sand filters modifications of filters. (Dual media, multimedia, upflow, biflow, Diatomaceous earth).


Unit VI: Distribution system: - Types of supply - Continuous, and intermittent. Types of system - Gravity; Pumping and combined gravity and pumping. Layouts of distributions system, Dead end, Grid iron, Circular system and Radial system. Maintenance of distribution system. Equalising storage, Type of storage reservoirs, capacity, Types of conduits, Relative merits, selection, joints, hydraulic design. Pipe laying and

BOOKS RECOMMENDED:

7CE05 PROFESSIONAL ELECTIVE – I
(i) ADVANCED WATER TREATMENT

SECTION-A

Unit - I: Requirements of water treatment facilities different unit operations and unit processes. Coordination of unit operations. Common attributes of water affected by conventional unit operations and processes. Aeration: rate of gas absorption and desorption, objectives of aeration, gravity aerators and spray aerators, governing factors, design of aerators, removal of methane, C02, H2S taste, design and odour.

Unit-II: Objectives of flocculation, chemical coagulation, concept of surface charge, coagulating effects of electrolytes, zeta potential, coagulants and coagulant aids, factors affecting coagulation.

Perikinetic and orthokinetic flocculation - mixing and stirring devices, flash mixing flocculators, construction and operation of flocculators, problems on design of flocculators. Pebbled bed flocculator.


SECTION-B

Unit-IV: Filtration: objectives, design, construction and operation of rapid and slow sand filters, filtering sand, grain size and size distribution, preparation of filter sand, hydraulics of filtration. Hydraulics of fluidized beds. Scour intensification, high rate, declined rate, upflow biflow, dual media, diatomaceous earth filters.

Unit-V: Disinfection: objectives, different disinfectants, chemical disinfection, theory, factors governing, and kinetics. Disinfection by Ozone. Disinfection by chlorine; free available and combined. available chlorine, break point chlorination, chemical technology and other uses of chlorine, manageable variables.


BOOKS RECOMMENDED:

7CE05 PROFESSIONAL ELECTIVE – I
(ii) ADVANCED GEOTECHNICAL ENGINEERING

SECTION-A

Unit - I: Clay mineralogy: Introduction, atomic bonds, classification and nomenclature, structure of clay mineral, K Ionite. Illite and Montmorillonite groups, physical properties, clay-water relations,
diffused double layer, thixotropy, base exchange capacity formation of different structure in soil deposits, electrical effects, electroosmosis, electrophoresis, stemming potential, zeta potential, clay mineral identification, DTA analysis, X-ray diffraction method.

**Unit II** - Seepage: Flownet for anisotropic soil media, construction of flownet for hydraulic structure on non-homogenous soil, directional variation of permeability in anisotropic medium. Numerical analysis of seepage in layered soil computation of seepage force, seepage through earthen dam resting on confined and unconfined medium entrance discharge and Transfer condition of line of seepage through earth dam.

**Unit-III**: Three dimensional consolidation. Equation, solution of 3 dimensional consolidation equation, consolidation by vertical sand drain and its design aspect, free strain consolidation with no smear, effect of smear zone on radial consolidation. Calculation of the degree of consolidation with radial drains and solutions of problems based on this.

**SECTION – B**

**Unit IV**: Expansive soils: origin of soil, intensification of expansive soil, swelling potential, factors affecting the swelling, different systems of classification, concept of swelling pressure and its measurements in the laboratory, special constructional measures adopted for the construction on expansive soils, special foundations adopted for the construction in expansive soils, concept of cohesive non-swelling techniques and its effect on expansive soil.

**Unit V**: Soil stabilization concept of mechanical stabilization, physical and chemical stabilization with organic and inorganic material like line, cement, lime, fly ash and mechanisms, various factors affecting stabilization, determination of bearing capacity of stabilized soil, laboratory and field methods of stabilization. On various properties of soil.

**Unit VI**: Geotextile: types, specifications, functions and various applications in the field of Geotechnical engineering. Reinforced earth, mechanism of reinforced earth, various constructional methods and its effect towards altering, the properties of soil, field situations for application of this techniques. Theory of Arching, effect of arching, design of yield strip, computation of vertical stresses.

**BOOKS RECOMMENDED**:
4) International Conference on Expansive Soils.
5) International Conference on Geotextiles.
6) Soil Mechanics for Road Engineers, AMSO Series.

7CE05 PROFESSIONAL ELECTIVE – I

**WATER POWER ENGINEERING**

**SECTION - A**

**Unit I**: Introduction, sources of energy, importance of water power, estimation of water power potential, primary and secondary power, load factor, pondage and pondage factor, load curve. Type of hydropower plants: low and high head, run of river, valley dam, diversion canal, high head diversion, pumped storage underground, general description, layout, topographical requirements of each of above.

**Unit-II**: Penstocks: general classification, design criteria, economical dia, anchorages and accessories. Water hammer: meaning, rigid and elastic water column theory, Allievi’s charts.

**Unit-III**: Surge tanks: Necessity, types, function, location, effect of sudden load change, Hydraulic design of simple surge tanks, stability of surge tanks.

**SECTION – B**

**Unit-IV**: Intakes: types, locations, requirements, trashrack and other components, control gates, emergency gates.

**Unit-V**: Hydel channel: power canal and forebay, general principles of alignment and capacity, balancing tank. Turbines: types, hydraulic features, size, general description of components and layout, specific speed, choice, approximate costs.

**Unit-VI**: Power house: types, general layout and approximate dimensions. Non conventional sources of energy: - tidal power, wind power, geothermal power, solar power, elementary principles and description, application of water power in drilling and blasting of rocks.

**BOOKS RECOMMENDED**:
7CE05 PROFESSIONAL ELECTIVE – I
(iv) PRESTRESSED CONCRETE

SECTION - A

Unit I: a) Analysis and design of beams - Rectangular, flanged and I sections, for Limit State of flexure, ultimate flexural strength, recommendations of I.S. codes.
   b) Analysis and design of end blocks in post tensional members - primary and secondary distribution zones, Bursting and spalling tensions.

Unit II: a) Shear strength of prestressed concrete beams - mode of failure in beams, recommendations of I.S. code, ultimate shear strength of concrete, Design of shear reinforcement.
   b) Deflection and bond in prestressed concrete.

Unit III: Analysis and design of continuous (upto two spans) and fixed beams. Elastic analysis, secondary moments, concordant cable, linear transformations.

SECTION - B

Unit IV: Analysis and design of prestressed concrete structures such as concrete pipes, poles, sleepers, water tanks etc.

Unit V: Analysis and design of portal frames, single storey and limited to two bays (fixed and hinged)

Unit VI: Design of prestressed concrete bridges (simply supported) for I.R.C. loadings or equivalent uniformly distributed loads.

NOTE: Candidates should use the latest I.S. Codes.

BOOKS RECOMMENDED:

23 24

7CE05 PROFESSIONAL ELECTIVE – I
(v) ARTIFICIAL NEURAL NETWORK & FUZZY LOGIC

SECTION - A

Unit I: Artificial intelligence, introduction, classification of artificial intelligence, tools of artificial intelligence, applications of A. I. in Civil Engineering.

Unit II: Expert systems, introduction, classification, tools, applications of expert system in Civil Engineering.

SECTION – B

Unit III: Neural network, introduction, classification, tools, applications of neural network in Civil Engineering.

Unit IV: Fuzzy logic, introduction, classification, tools, applications of expert system in Civil Engineering.

BOOKS RECOMMENDED:

7CE05 PROFESSIONAL ELECTIVE – I
(vi) ADVANCED CONCRETE TECHNOLOGY

SECTION - A

Unit I: Admixtures and construction chemicals: Introduction, admixtures, plasticizers (Water reducers), action of plasticizers, dispersion, retarding effect, superplasticizers (High range water reducers), site problems in the use of plasticizers, retarders, accelerators, air-entraining admixtures, pozzolanic or mineral admixtures, fly ash, silica fume, rice husk ash, metakaolin, ground granulated blast furnace slag (GGBFS), damp and water proofing admixtures, IS code provisions for admixtures.


SECTION – B

UNIT-IV: Special concrete and concreting techniques: Introduction to special concrete, Lightweight, aerated, no-fines, high density, fibre reinforced, polymer, prepacked, self-compact (self-leveled), and high volume fly ash (HVFA) concrete. Introduction to special concreting techniques, Gunite or shotcrete, ferrocement, roller compacted concrete, and ready mix concrete casting and applications.

UNIT-V: Repairs and rehabilitations: Introduction, need for repairs, crack width, interaction between permeability, volume change and cracking, polymer modified mortar, bond aid for plasters, guniting aid, silicon based water repellent materials, protective and decorative coatings, injection grout for cracks, coatings to embedded reinforcement, concrete repair systems, stages of repair works.

UNIT-VI: Non-destructive testing of concrete: Introduction, rebound hammer, limitations, rebound number and strength of concrete, penetration technique, pullout test, resonant frequency, pulse velocity method, corrosion analyser, rebar locators. Students must be shown video CD, slides, transparencies and photograph of actual structures.

BOOKS RECOMMENDED:
3. Neville, Brooks: Concrete Technology, ELBS.
5. Shetty, M. S.: Concrete Technology, S. Chand.


UNIT-II: Water pollution-sources of water pollution, effects on water bodies, D.O. sag curve, pollution control measures, water pollution act.


SECTION-B

UNIT-IV: Land pollution: solids its effect on the environment, various methods of collection, treatment and disposal of solid waste, Hazardous waste and risk analysis.


UNIT-VI: 1) Rural Sanitation - Collection & disposal of night soil, Sanitary Latrines.
2) Biogas plant - Capacity & Design.

BOOKS RECOMMENDED:

Unit III: Introduction to seismic design : Considerations for bridges, dams, chimneys.

SECTION-B

Unit IV: Vulnerability of buildings : use of Vulnerability Atlas and understanding techno legal issues with regard to buildings.

Unit V: Concepts in repair, restoration and seismic strengthening: retrofitting weakness in existing buildings, aging, weathering, development of cracks, material and equipment for repairs of masonry and concrete structures, study of IS : 13935.

Unit VI: Methodologies for repairs : for walls, roofs, slabs, columns and foundations of buildings in stone, brick or reinforced concrete.

BOOKS RECOMMENDED:

1) Anil K. Chopra : Dynamics of Structures, Prentice Hall of India Pvt. Ltd.

7CE06 THEORY OF STRUCTURES-II – Lab

PRACTICALS:
The laboratory work will be based on the following experiments (Any five experiments):
1. Influence line diagram for continuous beams.
2. Horizontal reaction of two hinge arch.
3. Forces and displacements in redundant trusses and frames.
4. Minimum two exercise based on theoretical course work.
5. Verification of Betty theorem
6. Verification of Maxwell Reciprocal Theorem.
7. Basic exposure to software for analysis.
8. Computer aided design of structures

Software: Anyone of the following software STAAD, SAP, NASTRAN, ANSYS, BUILD MASTER, SCADDS & STRUDS and any other reputed software (Any TWO)
1. Analysis and design of minimum three storied building
2. Cantilever or counterfort retaining wall
3. Analysis and design of steel structure

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

7CE07 GEOTECHNICAL ENGINEERING-II – Lab

LIST OF EXPERIMENTS: (Any six)
1. To determine the shear strength by conducting Field Vane shear test.
2. To identify the subsoil strata by conducting soil resistivity / seismic refractivity method.
3. To determine the bearing capacity of soil by conducting standard penetration test.
4. To determine the soil characteristic by conducting standard penetration test.
5. To determine the soil properties by conducting the static cone penetration test.
6. Computation of bearing capacity by analytical approach to verify with field test.
7. To determine the C- characteristic with respect to soil log bore presentation and interpretation of exploration.
8. To examine the soil characteristic with respect to soil log bore presentation and interpretation of exploration.

Compulsory: Introduction to Geotechnical Software, determination of bearing capacity, earth pressure etc. using this software.

7CE08 STRUCTURAL DESIGN-II – Lab

PRACTICALS:
1. Candidates are required to prepare at least two designs based on theoretical course detailed workings are necessary.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

7CE09 PROJECT & SEMINAR

Seminar based on Project shall be delivered in Seventh Semester only. 50 marks shall be given through the internal evaluation done by three member committee one of them will be guide.

Seminar shall be delivered with POWER POINT presentation.
SEMESTER: EIGHT

8CE 01 WATER RESOURCES ENGINEERING - II

SECTION-A

Unit-I: Reservoir Planning: Investigation, selection of site, control levels, Reservoir Sedimentation, Reservoir Capacity, Calculation of life Reservoir.
Dams: Different types and their suitability-factors governing the selection of types of dam for project
Earth Dams: Types of dams, causes of failure seepage and drainage arrangement, phreatic line, stability analysis, seepage control measures

Unit II: Gravity Dams: Types of dams forces acting, modes of failure; principles of design of straight gravity dams, Elementary and practical profile, Galleries, Earthquake and its effect on dams.

Unit-III: Diversion Head Works: - Selection of site and layout, components of diversion head works, design of weirs on permeable foundation, construction details of Kolhapur type weirs.
Spillways: Types of spillway, spillway capacity, Flood routing through spillways, types of crest gates. Energy dissipaters: meaning, objectives, location. Types hydraulic jump, jet diffusion and Bucket type,

SECTION-B

Unit-IV: Canal Irrigation: Types of canals, Parts of Canal irrigation system, Canal alignment, Design of unlined and lined Canals, Balancing depth, cross section of canal, propose and types of canal lining

Unit-V: Canal Masonry Works: Types and only design principles and description of
1. Regulation works: Canal fall, Head Regulator, Cross regulator, Canal escapes and canal outlets.
2. Cross drainage works: Aqueduct, Syphon aqueducts, super passage, canal siphon, level crossing

Unit-VI: Well Irrigation: open wells and tube wells, types of tube walls, duty of tube well water.
Water Management: Water management and distribution, cooperative water user organization, warabandi, conjunctive use of water. Water shed Management: Need of watershed management, importance of soil conservation measures, techniques ground water harvesting.
River Training Works: Need and types of river training works.

BOOKS RECOMMENDED:
2) Punmia: Irrigation & Water Power Engg.
7) Michael A. M.: Irrigation (Theory & Practice)
Unit VI: Air pollution: Introduction to air pollution, various pollutants their sources and their effects on man and material, prevention or air pollution at sources, introduction to control devices electrostatic precipitator & cyclones only human tolerance level Introduction to EIA and Environmental Audit.

BOOKS RECOMMENDED:
5) Dr. Bhide A.D., Sunderson B.B. : Solid Waste Management in Developing Countries.
6) Rao H.V.N. : Air Pollution.

8CE03 PROJECT PLANNING & MANAGEMENT

SECTION - A

Project planning- Steps, work break down structure, Scheduling, Project Monitoring & Controlling- Concept of Tracking, Reviewing and Rescheduling.
Planning Tools: Basic concept of Gantt Chart, Bar Chart, Milestone chart, their advantage, limitations and overcoming measures.


Unit III: PERT: Concept, technique, three time estimates, average time, Critical path, slack computation, S.D, Variance, Probability factor, crash programme, normal and crash cost, normal and crash time, cost slope, Numerical on Probability computation, crashing.

SECTION - B

Unit IV: Concept of resource smoothening and leveling, Cost Curves, Numerical of it.

Introduction to MicroSoft Project Planner software. Various stages and process for Work Breakdown structure, planning, scheduling and resource allocation for project in MSP. One Compulsory assignment for planning, scheduling and resource allocation for construction project using Microsoft Project Planner.

Unit V: Management- Feyolâ€™s Principal of Management, Functions of management, organization definition, type line, line and staff, functional organization, quality control, ISO. Safety management, construction hazards in multistage building, method of prevention of accident, injury rate, injury severity rate, injury index, National safety council, its role, recommendation, Material management, Objective, Functions, Inventory, Need for inventory, ABC, EOQ analysis.

Unit VI: Equipment Management:
(a) Power shovel: Construction, working, Output, factors affecting, cycle time, Problem n Output.
(b) Dragline: Construction, working, output, factor affecting output, cycle time, Problem on output.
(c) Concrete mixer, Tilting and non-tilting type construction working.

BOOKS RECOMMENDED:
2) Srinath L.S. : PERT & CPM.
3) Punmia & Khandelwal : PERT & CPM.

8CE04 PROFESSIONAL ELECTIVE – II
(i) ADVANCED DESIGN OF STEEL STRUCTURES

SECTION - A

Unit I: (a) Design of foot bridge(N-Truss or Pratt)
(b) Analysis and design for transmission tower lines

Unit II: (a) Design of self supporting steel chimney and its foundation.
(b) Design of through type truss bridge member for dead load and equivalent live load including top, bottom bracings and portal bracing.

SECTION - B

Unit III: Design of industrial buildings including gantry grider, gantry column, Design of knee braces.
Unit-IV:  
a) Design of north light trusses and lattic girder.  
b) Design of elevated rectangular, square pressed steel tanks and staging  

BOOKS RECOMMENDED:  
1. Ramchandra, Design of Steel Structure, Volume I and II  
2. Arya, Ajmani, Design of Steel Structures  
3. Duggal, Design of Steel Structures  

8CE04 PROFESSIONAL ELECTIVE – II  
(ii) ADVANCED WASTE WATER & INDUSTRIAL WASTE TREATMENT  

SECTION – A

Unit-I:  
1. Physical unit process: screening, mixing, flocculation, sedimentation, floatation.  
2. Design of Grit Chambers and Screens.  
3. Chemical Unit Processes: precipitation, gas transfer, adsorption

Unit-II: Biological Unit Process: fundamentals of biological treatment. Design of trickling filter & activated sludge process.

Unit-III:  
1. Low cost waste water treatment: design of oxidation pond and aerated lagoon  

SECTION – B

Indian standards for discharge of treated waste water on land, into municipal sewers and natural water courses.  
Sampling of Waste Water: Representative sampling. Grab and composite samples.

Unit-V: General Approaches to Planning of Industrial Wastewater Treatment and disposal. Equalization and proportioning Neutralization. 
Treating different effluent streams separately. Including/excluding domestic wastewater along with the industrial waste. Treating industrial wastewater along with town waste.

Unit-VI: Process flow diagram, characteristics and treatment of various industrial wastes. Industrial wastes of pulp and paper, textiles, tannery, food, canning, sugar mills, distillery, dairy, Pharmaceutical, Electroplating etc. Case study of any one industry.

BOOKS RECOMMENDED:  

8CE04 PROFESSIONAL ELECTIVE – II  
(iii) FINITE ELEMENT METHOD  

SECTION – A

Unit-I: Continuum structures, discretisation, finite elements, nodes, variational principle, minimum potential theorem, relation to Rayleigh-Ritz method.

Unit-II: Interpolation, Lagrangian, Hermition shape functions, natural coordinates, area and volume coordinates, coordinate and derivative transformations.

Unit-III: 2-D plane stress and plane strain analysis, constant strain triangle, rectangle. 3D analysis, tetrahedron & parallelepiped elements.

SECTION – B

Unit-IV: Isoparametric elements, plane stress, plane strain and solids, numerical integration.

Unit-V: Beam straight with C and C continuity, numerical integration to cater for membranes, bending and torsion combination.

Unit-VI: Programming aspects, geometry, connectivity, code numbers alternate data types, half band data preparation, flow charts, typical subroutine for assembly, shape functions, solution of equations, stiffness matrix.

BOOKS RECOMMENDED:  
1. Desai, C. S., Abel, Introduction to Finite Element Method  
2. Cook, Concept and application of Finite Element Method  
3. Patwardhan, N. R. Illustrated Finite Element Method  
Unit-I: Introduction to Dam Engineering: Different classification for dams, relative advantages and disadvantages of various dam selection or types of dam, Investigation of dam sites, Engineering surveys, geological investigation, subsurface exploration programme, economic height of dam, Construction machinery, material, money, inventory.

Unit-II: Rockfill dam: Introduction, general characteristics, materials and testing of rockfill material, foundation of rockfill dam, design, rockfill placement, examples.


SECTION – B

Unit-IV: Spillways: choice of types, crest gates, hydraulic design, comparison, approach and tail channel, J.H.C. & tail water rating curve. Energy Dissipaters: types, components, design of hydraulic jump type, basins, ski-bucket type, roller bucket.

Unit-V: Head Regulators: requirements, types, foundation treatment including uplift consideration, Bank connection, energy dissipation, hydraulic design of opening and barrel, ventilation, types of gates. Approach Channel, case study for one on rock foundation and one on permeable foundation. Model Studies: scales design principles, materials, scale effects for model of dams spillways.

Unit-VI: Instrumentation: In earth dam and solid gravity dams, piezo meters, settlement, gauges, (surface monuments, base plate, cross arm) strain meters joint meters, thermometers, stress meters, pore pressure cells, plumb-bob Seismograph. Water level gauges (description, object, location, working, installation of each, design not expected). Special problems: increasing height of masonry and concrete dams, strengthening, repairs and maintenance, leakage, evaporation controls. evaporation controls.

BOOKS RECOMMENDED:
1) Sharma H.D: Concrete Dams, Metropolitan Book Co, Delhi.
2) Varshney R.S.: Concrete Dam, Ox IBH, Mumbai.
4) USBR: Design of Small Dams.
5) USBR: Design of Large Dams.
8) USBR: Design of Gravity Dam.
(C) Ground water studies: water bearing characters of different types of Basalts. Soil & water preservation techniques of civil engineering significance and underground bandhara. Exploration of tubewells in alluvium and sandy alluvium substrata for drinking water oses procedures and need thereof. Deciding aquifers for tubewell exploration & development of tubewells conducting yield tests of tubewell.

Unit III: (A) Geology of soil formation: geological factors which govern the engineering characters of soils. Soil derived from different types of rocks which can be used for casing & hearting of earthen dams. Nature of river alluvium in Maharashtra. Problem water logging & its remedial measures.

(B) Construction material: properties of different types of rocks that can be used as rubble for masonry, road metal, railway ballast, concrete aggregates etc. Problem of alkali aggregate reaction. Scarcity of sand in Deccan trap region, suitability of compact & gdaoloidal basalt as a substitute of sand after crushing.

(C) Geology of cut-off trench: geological logging and mapping of cut off trench of irrigation projects. Applicability of grouting in irrigation projects & different grouting techniques.

SECTION-B


(B) Aerial photo interpretation: interpretation of aerial photos from the point of view of rock types, geological structures, selection of dam sites and alignment of roads, railways & ghat interpretation of lineaments for groundwater.

(C) Town planning: role of geology in town planning. Important case histories of the old town planning.

Unit V: Geophysical principle of electrical resistivity survey, its utility in determining the depth of overburden, foundation grade rocks, gullies & other geological structures by having case histories of dams & tunnels, significance of electrical resistivity survey in ground water studies, brief introductory ideas regarding seismic, magnetic and gravity surveys and their applications in various fields.

Unit VI: (A) Rock Mechanics: Engineering properties of rocks, general properties, strength of rocks, elasticity of rocks. Residual stresses in rock masses, classification system in rock engineering - Terzaghi load classification, Lauffer-Pacher classification. Rock quality gnation (RQD), rock structure rating (RSR), concept of Wickham et al. (1972)

(B) Environmental Geology: role of geology in environmental engineering, geo-environmental: soils as resources, wind erosion, erosion by moving water, predicting & controlling erosion, soil erosion & land use decisions, problem soils. Reactivation of pre faults, earthquakes in Peninsular India, intensity & magnitude, assessment. Himalayan earthquakes, landslides - characterisation, landslide analysis, dimensions of landslide hazard, landslide potential, case histories, subsidence, response to subsidence prediction, costs of subsidence, case histories.

BOOKS RECOMMENDED:
1) P.W.D. Hand Book, Chapter No. 6.
2) Geological Survey of India - Engineering Geology Case Histories, Parts I & II.
11) Pandey S.N.: Text Book of Photo Geology.

8CE04 PROFESSIONAL ELECTIVE-II
(vi) MATRIX COMPUTER ANALYSIS OF STRUCTURES

SECTION-A

Unit-I: Solution of simultaneous algebraic equations, Gaussian elimination method, Half-band matrices, computer programme.
Unit-II: Finite difference method, application to plate deflection problems for fixed and simply support conditions.

Unit-III: Flexibility method, static redundancy, flexibility coefficients, compatibility conditions, application to continuous beams, single-bay single story portals, pin joined plane trusses.

SECTION-B

Unit-IV: Stiffness method, kinematic redundancy, equilibrium equations, member stiffness matrix and structure stiffness matrix, assembly procedure, application to continuous beams, pin jointed plane truss, numerical examples upto three unknowns.

Unit-V: Stiffness matrix of plane frame member with axial deformation (6x6), Grid member (6x6), transformation of forces and displacements, member and global coordinate system.

Unit-VI: Data and program organization for stiffness method, various coding systems, member-joint and joint-coordinate relations, member-displacement relations, code number approach, methods of introducing boundary conditions for restrained displacements.

BOOKS RECOMMENDED:
1. Gere, Weaver, Analysis of framed structures
2. Rubinstein, M. F., Matrix computer analysis of structures
3. Matrin, M. C., Introduction to matrix methods of structural analysis

8CE04 PROFESSIONAL ELECTIVE – II
(vii) ADVANCED STRUCTURAL ANALYSIS

SECTION - A

2. Shear centre for thin walled beam section.

Unit – II: 1. Infinite & semi-infinite beams resting on elastic foundations.

Unit – III: 1. Cantilever moment distribution method, application to rigid jointed plane frames.
2. Vierendeel girders - analysis for vertical sway cases only.

SECTION - B

Unit – IV: 1. Finite difference method, application to beam deflection problems
2. Minimum potential principle, Rayleigh & Rayleigh-Ritz approach to continuous problems, application to simply supported and cantilever beams using power series and trigonometric series.

Unit – V: Introduction to theory of elasticity - (treatment in Cartesian co-ordinates), state of stress at a point, stress & equilibrium equations, strain-components, stress-strain relations, generalized Hooke's law, strain plane stress and plane conditions, stress and compatibility for 2D.

Unit – VI: 1. Analysis of columns loaded laterally.
2. Structural response to earthquake, analysis of multistoried frames by I.S. code provisions.

BOOKS RECOMMENDED:
1. Norris, Wilbur, Elementary Structural Analysis
2. Timoshenko & Goodier, Theory of Elasticity
3. Juikrishna, Chandrashekharan, Element of Earthquake Engineering, Sarita Publication, Meerut (U.P.)

8CE04 PROFESSIONAL ELECTIVE – II
(viii) ROCK MECHANICS

SECTION - A


Unit II: Rock excavation : Blasting - objectives, blasting materials, blasting methods, open cut blasting, control blasting operation, precautions. Drilling, braking & cutting. Machines used for rock excavation.


SECTION-B

Unit IV: Rock strength & deformability : modes of rock failure, stress-strain behaviour in compression, Mohr- Coulomb failure criteria, Griffiths crack theory, empirical criteria for failure, effect of size


BOOKS RECOMMENDED:

8CE04 PROFESSIONAL ELECTIVE - II
(ix) ADVANCED DESIGN OF R.C.C. STRUCTURES

SECTION - A
[BY LIMIT STATE METHOD]

Unit-I: 1) Design of Portal frame up to two bay two storied symmetrical frame for symmetrical loading.
2) Design of circular slab for uniformly distributed load only, Introduction to grid floor slab.

Unit-II: 1) Design of a footbridge and simply supported slab deck bridge for I.R.C. class A loading.
2) Design of RCC girder (T beam) bridge for I.R.C. class A loading.

SECTION - B

Unit-III: 1) Structural response to earthquake, Analysis of multistoried frame by seismic coefficient method.
2) Design of square bunkers using Rankine theory. Design of Silos.

Unit-IV: 1) Design of R.C.C. Intze tanks.
2) Design of staging for Intze tanks with raft foundation.

BOOKS RECOMMENDED:
1. Suhil Kumar, Treasure of R. C. C. Design
2. Jain, A. K., Reinforced Concrete (Limit State Method)
3. Shah, Karve, Design of R. C. C. Structures
4. N. Krishna Raju, Advanced R. C. C. Design
5. Rajgopalan, K., Storage Structures.

8CE 05 WATER RESOURCES ENGINEERING – II – Lab

TERM WORK : Five problems from the following to be worked out by the students whenever necessary scale drawing on half empirical size must be drawn : Practical examination shall consist of viva voce.
1. Fixing control levels of Reservoir from given data.
2. Cross section, plan, L-section of Earth dam showing all components; details of drainage of downstream casing.
3. Design and Drawing of elementary and practical profile of gravity dam.
4. Design and drawing of diversion weir on permeable foundation.
5. Design and Drawing of ogee spillway with energy dissipaters.
6. Computer Aided design of unlined and lined canal.
7. Drawing of any Four canal structure (No design)
8. Field visit

8CE06 ENVIRONMENTAL ENGINEERING – II - Lab

1) Analysis of waste water (any four) - BOD (for domestic waste), COD (for industrial waste), Solids (Volatile), SVI, Nitrogen, Chlorides
2) Air sampling & Analysis of SPM.
3) Physical characteristic of solid waste
4) Sketches of sewers appurtenances - Manholes - different types storm water inlets, overflows, inverted siphons, automatic flushing tanks, ventilation in sewers.
5) Report of Field visit to Municipal wastewater treatment plant/Industrial Effluent treatment

8CE07 PROJECT & SEMINAR
Complete Project Report in a group of Maximum 9 students shall be submitted.
Out of 75 internal marks, 25 marks shall be given through the internal viva by three member committee one of them will be guide.

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SYLLABUS
PRESCRIBED FOR
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: SEVEN

7ME01 MACHINE DESIGN AND DRAWING – II

Unit I: 

a) Design of Shaft: Material, Design on the basis of strength considering shaft subjected to 
   - Twisting moment only 
   - Bending moment only 
   - Combine twisting and bending moment 
   - Design on the basis of rigidity.

b) Design of Key: types, strength of key

c) Design of Coupling: types, requirements of good couplings, design of sleeve coupling, clamp or compression coupling, rigid flange coupling, flexible flange coupling.

Unit II:

a) Antifriction Bearings: Types of bearing, construction, designations, standard load ratings by AFBMA for static and dynamic loads, life of bearings, selection of bearings, lubrication, mounting and enclosure,

b) Journal bearings: lubrication of bearings, stable lubrication, thick film lubrication, pressure distribution, minimum film thickness, relations of variables-viscosity, coefficient of friction, speed, pressure, length and diameter, bearing modules, viscosity-Temperature chart, sommerfeld number, selection of lubricant, design procedure and numericals.

c) Design of belts: 
   Flat belts types, material and construction of belt, type of drives, slip, creep, Design of belt.
   V-Belts- Construction and types, design of V Belts.

d) Wire Rope: Selection, Construction, classification, designations, stresses in wire rope, selection of wire rope for given loads.

Unit III:

- Design of Gear Classification, law of gearing, forms and system of teeth, interference, beam strength of teeth, dynamic tooth load, wear tooth lead, tooth failure.
  a) Spur gear - Design of gear
  b) Helical gear: Classification, face width, formative teeth number, strength of gear, Design of gear
  c) Bevel gear: Classification, pitch angles, strength of gear, Design of gear
  d) Worm gear: Types, efficiency of gear, Design of gear.

Unit IV: 

a) Design of I.C. Engine parts: Design of Cylinder, Piston, Piston rings, Piston pin, connecting rod and crank.

b) Design and drawing of Governor (Parts and Assembly) 
   Types of Governors, Design procedure and problems, Hartnell’s Governor (including design of Spring, spindle, lever and bails).

BOOKS RECOMMENDED:

TEXT BOOKS:
3) Machine Drawing, N.D.Bhat, Charotar Publication

REFERENCE BOOKS:
3) Machine Elements in Mechanical M.F. Spotts
4) Machine Design, Black P.H. Published by McGraw Hill,
5) CAD CAM Concepts & applications, Chenna Kesava, PHI Publications
6) Design Data Book by- P.S.G Koimbatore
7) Design Data Book by Mahadevan
(Use of any data book from the above will be permitted during the examination).

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7ME02 ENERGY CONVERSION – II

SECTION – A

UNIT I: Reciprocating, Air Compressions: Industrial uses of compressed air, Methods of compression and efficiencies of compression, Methods of reducing losses during compression
single and multistaging of compressions, clearance volume and its effect on work done and volumetric efficiency, condition for minimum work in two stage compression, intercooling and its effects, Overall, isothermal and adiabatic efficiencies, IHP, BHP requirements and after cooler. (7 Hours)

UNIT II: Rotary Compressors :- Comparison between reciprocating and rotary compressors, difference between fans, blowers and compressors, general equations for rotary machines, Vane, Roots blower, construction, working and velocity diagrams of centrifugal and axial flow compressors, performance characteristics of blowers and compressors. (8 Hours)

UNIT III: Definitions, classifications of refrigeration systems : Air refrigeration, Bell-column cycle, reversed cannot cycle, revered Bryton cycle, vapour compression refrigeration, vapour absorption refrigeration based on solar and waste gear recovery. Analysis of simple saturated vapour compression cycle, representation on T-s, Ph diagrams, Problem on simple saturation cycle, Need for CFC free refrigerants.

Air conditioning :- Definitions, classification and applications. Phychromatic properties, phychrometric charts. (8 Hours)

SECTION – B

UNIT IV: Classification of gas turbines, construction and working Gas turbine ideal and actual cycles constant volume, constant pressure, (Open and Closed) cycle analysis, Inter cooling, Regeneration and reheating application, optimum and maximum pressure ratios, work rations, Performance characteristics. Fields of application of gas turbine power plant, Introduction to Jet Propulsion, Ram jet, turbo jet. (No numerical treatment for Jet Propulsion). (8 Hours)

UNIT V: NUCLEAR POWER:- Fussion, fission, Chain reaction, conversion and breeding in nuclear fission, components of water, gas cooled, liquidized metal cooled thermal reactors.

UNIT VI: Introduction to renewable energy, Wind Energy, solar, fuel cell, bio-gas, MHD, basic requirements, Advantages, Disadvantages and applications. (7 Hours)

RECOMMENDED BOOKS:-

TEXT BOOKS:
1. Steam and gas turbines R, Yadav; Central Publication Allahabad.
3. Power Plant Engineering; R.K.Rajput; Laxmi publication
4. Solar Energy by S.P.Sukhatme; Tata Mcgraw-Hill in New Delhi

REFERENCE BOOKS:
1. Thermal engineering by Mahesh M.Rathore; Tata Mcgraw-Hill in New Delhi
2. Gas Turbines Theory- By Cohen and C.F.Rogers, P.H.I.H. Saravanamutto Heritage Publishers,
5. Renewable Energy; Godbfrey Boyle, Oxford University Press.

7ME03  INDUSTRIAL MANAGEMENT & COSTING

UNIT I: Concept, Principles and Techniques of Management; Evolution of management thoughts, functions of management, organization structure & relationship.

UNIT II: Marketing and Management : Marketing strategy market research, buying, motives, types of market, new product development, Product life cycle, Sales Organization, advertising, methods of selling, consumer behaviour.

UNIT III: a) Functions of personnel management, Human resource planning, Recruitment, training and development , workers participation in management, joint consultation, collective bargaining.
   b) Materials management, classes of materials, scope of material control, scope and function of purchasing department, purchasing procedure, inventory control, ordering procedure, material identification, store function.

SECTION - B


UNIT V:a) Introduction to costing and costing Techniques: Definitions, objectives, elements of costs, components of cost, job costing, simple process costing, normal and subnormal losses in process, waste, scrap. (8 Hours)
   b) Financial statements :- Profit and loss statement, balance sheet

   b) Financial statements :- Profit and loss statement, balance sheet
c) Depreciation Analysis :- Causes and significance, methods of calculation of depreciation. (7 Hrs)

TEXT BOOKS:
1. Management-principles, processes and practicals, Anil Bhat, Aryakumar; Oxford University Press
2. Management Accounting; Paresh Shah; Oxford University Press

REFERENCE BOOKS:
1. Essentials of Management; Koontz, Harold; Mcgraw-Hill Education(India)
2. Cost Accounting; Jawahar Lal; Tata Mcgraw Hill Publishing
3. Cost Accounting by Bhar.

SECTION - A

UNIT I:
Automation & Types, Automation for mass manufacturing and assembly, Automation of continuous processing systems, Detroit type automation, Automated flow lines. Methods of work part transport, transfer mechanisms, control function. General terminology and analysis of automated flow line, partial automation, assembly, systems and Line balancing.

UNIT II:
NC/CNC :- Basic concept, N.C. controls- point to point, straight-cut and continuous path control, machine control units, closed system, NC machine components, tooling, CNC & DNCs, Manual part programming formats, programming languages, APT,ADAP, EXAPT etc. NC/CNC Programming- Various Programming codes, Manual part programming for drilling, Milling and turning operations, Examples of APT, Sensors and adaptive control in machining, Applications and economics of CNC.

(12 Hrs.)

UNIT III:
ROBOTICS :- Introduction to cybernetics, Evolution of industrial robots, Robots anatomy, Arm geometry, drive system and end efforts, sensors, Evolution of geometrical configurations for robots Programming techniques of Robots. Application of Robots in manufacturing, casting, welding, painting, m/c loading, handling, heat treatment, assembly, inspection, etc. Technical Specifications of a Robot, Robot economics. (9 Hrs)

SECTION - B

UNIT IV:
GROUP TECHNOLOGY AND PROCESS PLANNING :
Introduction-Part families, part classification and coding systems, Group technology machine cells, advantage of group technology

PROFESSIONAL ELECTIVE – I

7ME05
1) NON-CONVENTIONAL ENERGY SYSTEMS

SECTION – A


Unit II: Radiation transmission through covers :- Reflection and absorption of radiation, optical properties of cover systems in transmittance effects of surface layers on transmittance,
transmittance absorptance product. Solar Energy collections:- Heat transfer for solar energy utilization, flat plate collections such as liquid & air collector, collector overall heat transfer coefficient, temperature distribution between the tubes & the collector effect in heat gain, heat removal and flow factor, Testing of collectors & effects of various parameters on the performance. Introduction to various systems of concentrating collectors

Unit III: Solar energy Utilisation :- Application of solar energy in heating, cooling, pumping, power production, distillation, drying, solar cookers, solar pond, solar furnaces, Solar Energy Storage:- Methods of storage such as sensible, latent heat & thermochemical storage, selection of method of storage, properties of storage materials and different arrangements of storages. (No alphabetical treatment)

SECTION - B

Unit IV: Energy from Ocean : Tidal Power :- Types of tidal plants such as single and two basin plants, power developed and operation of tidal power plant. Ocean thermal energy conversion system. Ocean temp. profile, OTE Power plant development, controlled flash evaporation, indirect vapour cycle, Salinity differences conversion of salinity gradient resources, cosmonic pump, dylitic battery, etc.
Wind power :- Wind speed data, power in the wind, wind power development, types of wind miles, application for pumping and power generation.  

Unit V: Biomass Energy Resources; Mechanism of green plant photosynthesis, efficiency of conversion, solar energy plantation, Biogas- Types of Biogas plants, factors affecting production rates, Pyrolysis, Gasification Types & Classification of vegetable oils a liquid fuel and their properties, esterification process, formation of Biodiesel, Biodiesel & its properties, suitable species for Biodiesel formation and its cultivation, byproduct formation during esterification, Biodiesel economics.  

Unit VI: Direct Energy Conversion :- Photo voltage cells: Principle, concept of energy conversion, conversion efficiency, power output and performance, storage, Fuel Cells: Principles types of fuel cells, conversion efficiency, Geothermal energy resources, power generation methods like vapour dominated, water dominated, flash steam, binary fluid and total flow concept of power generation.  

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TEXT BOOKS :-
1. Solar Energy, S.P. Sukhatme, TMH

REFERENCE BOOKS :-
1. Treatise on Solar Energy : H.P. Garg; John Wiley & Sons
2. Renewable Energy Conversion, Transmission and Storage, Bent Siresen; Elsevier Publication

7ME05 PROFESSIONAL ELECTIVE – I 

(2) TOOL ENGINEERING

SECTION – A

Unit I: Theory of metal cutting : Chip formation, shear angle, shear strain-velocity relations, undeformed chig thickness, Force relations, Merchant circle, energy consideration in metal cutting, Tool wear tool life, tool life criterion, mach inability, tool materials, properties & types, Newly invented tool material and their types, cutting fluids.  

Unit II: Single point cutting tools-classification and nomenclature, various systems of nomenclature, single point cutting tool design, recommended speed, feed and tool angles determination, clamping arrangements and form tools. Twist drills & Reamers ï Geometry types, cutting forces, Numerical on Power & torque.  

Unit III: i) Broaches ï Geometric elements of broach teeth, classification of broaches, design of broaches, cutting forces. ii) Milling cutters- Geometry elements of broach teeth, classification of broaches, design of broaches, cutting forces. iii) Thread cutting tools:- Geometry of taps and dies. iv) Gear cutting tools :- Geometry of gear shaper cutter, gear hobs.  

SECTION - B

Unit IV: Jigs & Fixtures : Design economics, principles of locations, types of locations, prevention of jamming, problems of chip & dust in location, use of dowle, Reducant location, Principles of clamping, types of clamps, power clamping, Tool guiding & tool setting, types of drill bushes, types of drill jigs & their designs, Turning, Milling, Grinding, Broaching and Assembly fixtures, Indexing devices in jigs & fixtures.
Unit V: Press tools, Classification of presses, Theory of sheet metal cutting, clearance, cutting force calculations, Methods of reducing cutting forces, centre of pressure & its significance, classification of press working operations, Theory of bending, spring back action in metals, drawing fundamentals, calculation of drawing & bending forces, planning for cupping operation, stock layout. (09 Hours)

Unit VI: Design of press working tools, Types of die construction, function & nomenclature of die components Cutting Dies-Blanking & Punching, Forming Dies-Forming, Drawing and Bending etc. Design of Compound, Combination and progressive dies. Miscellaneous dies- Horn die, cam-action die, rubber & bulding die, sub-press die. (9 Hours)

TEXT BOOKS:
1. Fundamentals of Tool Design, -A.Kumar (Dhanpatrai & Sons)

REFERENCE BOOKS:
1. Tool Design - Cyril Donaldson (Tata Mcgram Hill)
2. Jigs & Fixtures - P .H.Joshi (Tata Mcgram Hill)
3. Metal Cutting Theory & Cutting Tool Design- Arshinov (Mir Publications)
4. Tool Design - ASTME (ASTME)
5. Fundamentals of Metal Cutting & M/c Tools - Juneja (Age Internatioanal).

PROFESSIONAL ELECTIVE -I
7ME05 (3) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

SECTION – A

Unit I: Introduction to Artificial Intelligence (AI) – Overview of AI, definition and importance of knowledge based systems, representation of knowledge, knowledge organization, knowledge manipulation, acquisition of knowledge. (6 Hours)

Unit II: Introduction to Expert Systems - Features of expert systems, knowledge engineering, basis expert system terminology, human experts and artificial experts, algorithmic nd heuristic methods, difference between conventional programms and expert systems, Architecture of expert systems. (8 Hours)

Unit III: Knowledge Representation I Rule based methods, rule execution, forward chaining and backward chaining, knowledge representation using semantic nets, structure of semantic nets, Frame-based methods . (8 Hours)

SECTION – B

Unit IV: Expert system Tools – Types of tools for expert system building, system building aids, support facilities, debugging aids, I/O facilities, exploitation facilities, knowledge base editors, stages in the development of expert system tools, procedure oriented methods, object-oriented methods, logic-based methods, access-oriented methods. (7)

Unit V: Building an expert system ï Development phased in expert system building, development constraints, reliability, maintainibility, examples of expert systems, difficulties in development of exprt systems (7)

Unit VI: Fuzzy Engineerig- Fuzzy logic, fuzzy expert systems, fuzzy sets, membership functions, fuzzy rules for approximate reasoning, fuzzy inference generation, defuzzification, development of rules matrix, applications of fuzzy expert systems for design of industrial controllers,

RECOMMENDED BOOKS :
TEXT BOOKS:
2. INTRODUCTION TO ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS by Dan W.Peterson, PHI
3. FUZZY LOGIC by John Yen, Reza Langari, Pearson

REFERENCE BOOKS:
1) Expert Systems Theory & Practice, By Ermine, Jean Louis.PHI
2) Expert systems in Engineering , By D.T.Pham.JFS Pub.
3) Expert system application bySumit Vadera,Sigma press
4) Artificial Intelligence by Winston P.H.,Pearson

PROFESSIONAL ELECTIVE –I
7ME05 (4) MECHATRONICS

SECTION – A

Unit I: Introduction to Mechatronics – Definition, Block diagram & Example, Basics of Sensors, Position & Speed Sensors, Proximity Sensors & Switches, LVDT, Digital optical encoder, Temperature Sensors Actuators-Functions, Electromagtic Principles, Solenoids and Relays, working of DC motors and stepper motors, hydraulic and pneumatic actuators, (6 Hrs.)

Unit II: Data Acquisition: Analog signal processing using operational amplifier- Indroduction, types of amplifiers, sample and hold circuits, introduction to data acquisition, sampling thermo, Quantizing theory, Analog to digital conversion, Analog to digital convertor, Digital to analog conversion, Multiplexer. (6)
Unit III: Mechatronic Systems – control architecture Introduction, Control architecture, Analog circuits, digital circuits, Design of logic networks, sequential logic, flip-flops, application of flip-flops, micro-controlrs, Programmable logic controller. (6 Hrs)

SECTION - B

Unit IV: Control Valves – Study of different control components and pneumatic & Hydraulic system- Construction, worling and function of Directional control valve, Flow control valves, Pressure relief valve, pressure reducing valve, sequence valve with symbols. (6 Hrs)

Unit V: Pneumatic System – Design and analysis of pneumatic circuits, Synchronizing, Power chuching operations, controlling the rate of speed of piston, circuit to move with piece around a corner, circuit to move a work piece at a constant speed . (6 Hrs)

Unit VI: Hydraulic System – Design nd analysis of Hydraulic systems-Sequencing, pneumohydraulic, regeneration circuit, circuit to control tool movement on lathers, grinders, etc. (6 Hrs)

TEXT BOOKS:
2. Pneumatics and Hydraulics by H.L.Stewart.

REFERENCE BOOKS:
2) Mechatronics Î A multidisciplinary approach 4/e by W.Bolton- Pearson Publication,
3) Automation, Production systms and CIM by M.PGroover- Pearson Publication.

7ME 06 PROJECT & SEMINAR

7MEO7 MACHINE DESIGN AND DRAWING-II – LAB.

List of Exercises for Term Work :
1) Sheet 1 : Design of shaft
2) Sheet 2 : Design of coupling or any one type of gears.
3) Sheet 3 : Design of I.C. Engine Part (any one based on sysllabus)
4) Sheet 4 : Preparation of detail drawing of simple machine assembly (Pedestal bearing, Plumer block, simple eccentric, stuffing box, Cross head, Tail stock, Tool post, C-clamp, Screw jack, Boiler sfety valve i Any1 of these)
5) Sheet 5 : Preparation of assembly drawing of simple machine assembly (Any 1 machine from Practical 4)

Note :- Any one from the above list should be done using Computer Programming/software.

7MEO8 ENERGY CONVERSION II – LAB.

List of Experiments:
Any six of the following :-
1. Trial on reciprocating compressor.
2. Trial on centrifugal blower.
4. COP calculation of vapour compression system.
5. Study of room air conditioner.
6. Study of gas turbine with the help of models.
7. Study of Pyrhielometer and measurement of direct radiation.
8. Study of testing of a flat plate controler
9. Study of Solar still and trial on it.
10. Study of a photovoltaic system.
Practical Examination shall consist of viva voce based on above term work.

7MEO9 AUTOMATION ENGINEERING – LAB.

PRACTICALS:-
At least six practicals will be based on the following topics.
1. Preparation of Manual part program for Point-to-Point control. Ex; Drilling Operation.
2. Preparation of Manufal part program for two-axis CNC turning operatio.
3. studyof working & Programming of XY plotter.
4. Programming Examples on APT.
5. Study of performance of Robots.
6. Simullation of CNC Machining.
7. Case study of CAPP.
8. Case study on GT.
9. Performance on NC and CNC m/c.
10. Study of computer aided quantity control (CAQC).

PRACTICAL EXAMINA TION :-
Practical Examination shall consist of viva voce based on above term work and syllabus.

7ME10 PROFESSIONAL ELECTIVE – I

(1) NON-CONVENTIONAL ENERGY SYSTEMS–LAB.

List of practicals :
Any six practicals will be based on the following topics :-
1. Study of Pyrhiometer and measurement of direct radiatoin.
2. Study of pyranometer and measurement of global and diffuse radiation.
3. Study of sunshine recorder and measurement of sunshine hours.
4. Study and testing of a flat plate recorder.
5. Study of various concentrating collectors.
6. Study of a solar absorption of refrigerating system.
7. Study of a solar dryer.
8. Study of wind mill and trial on it.
10. Study of sterling cycle engine and a trial on it.
11. Study of a Solar Still and trial on it.
12. Study of a gasifier and trial on it.
13. Study of a Photovoltaic system & trial on it.

**Practical Examination:**
Practical Examination shall consist of viva voce based on the term work and syllabus.

**7ME10 PROFESSIONAL ELECTIVE – I**
**TOOL ENGINEERING – LAB.**

**TERM WORK:** ANY EIGHT OF THE FOLLOWING:
1. Design & drawing of single point cutting tool.
2. Design & drawing of form tools.
3. Design & drawing of drill.
4. Design & drawing of broach.
5. Design & drawing of milling cutter.
6. Study of geometry of reamer.
7. Study of gear cutting tools.
8. Measurement of forces in Orthogonal cutting by Dynamometer.

**Practical Examination:**
Practical Examination shall consist of viva voce based on the term work and syllabus.

**7ME10 PROFESSIONAL ELECTIVE – I**
**(1) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS – LAB**

**Practical:** The students are expected to perform five practicals based on the above syllabus.

**7ME10 PROFESSIONAL ELECTIVE – I**
**(2) MECHATRONICS – LAB.**

**PRACTICALS:** At least six practicals will be based on the above syllabus.

**Practical Examination:**
Practical Examination shall consist of viva voce based on the term work and syllabus.

**8ME01 SEMESTER: EIGHTH**

**8ME01 PROFESSIONAL ELECTIVE – II**

**SECTION – A**

**Unit I:** Classification of automobiles, chasis types, Power Unit- Functions and locations power for propulsion, engine mounting, engine parts- types, construction and functions, Multiple cylinder engines, General considerations of engine balancing, firing order . (7 Hrs)

**Unit II:** Fuel feed systems - fuel fees systems for petrol engines. Fuel pumps, fuel filters, Air filters, Basic principles of MPFI and CRDI. Multipoint fuel injection Systems (MPFI) Common Rail Diesel Injection Systems (CRDI) Controlling system : purpose, types of cooling systems, liquid cooling system-wa... (8 Hrs)

**Unit III:** The electrical system, Battery Capacity, standard capacity ratings, starter motor drive- Bendix drive, over running clutch, solenoid switch and shift, Ignition system: Battery coil ignition system, Ignition timing and its effect on engine performance, Ignition advance mechanisms, Electronic Ignition system.

**SECTION – B**

**Unit IV:** Transmission system: Layout, types of clutches, single plate friction clutch and multiple clutch, clutch adjustments, clutch troubles an remedies, Gear Boxes: - Sliding mesh, constant mesh and synchronmesh gear box, function of over drive, trouble shooting and remedies, torque convertor, automatic transmission, Propeller shaft, hotckiss drive, torque tube drive, differential.

**Unit V:** Breaking system:- Mechanical, hydraulic brakes, power brakes, and vacuum brakes Fault finding and maintance of brakes, Steering system :- Fuction, types of linkages, steering gears, steering gear ratio, wheel balancing, wheel alignment castor, king pin inclination, toe-in & toe-out & their effect, introduction to power steering.

**Unit VI:** Suspensions:- Rigid axle and independent suspnension system, shock absorbers. Auto lubrication :- Types of lubrication, their tests and ratings, multi-viscosity oils, chassis lubrication, Engine lubrication :- types of lubicaing system, full premier system, dry sump system, oil pump, oil filters system- by pass system, full
flow system, oil breather, crankcase ventimeter, Engine lubrication troubles and remedies.

TEXT BOOKS:

REFERENCE BOOKS:
1. Automotive Mechanics; Crouse & Anglin, TMH.
2. Automotive Mechanics ; J Heitner; East West Press
3. Automotive Mechanics ; S.Srinivisan; TMH.

8ME01 PROFESSIONAL ELECTIVE – II
(2) PRODUCTION PLANNING AND CONTROL

SECTION – A
Unit I :- INTRODUCTION
Objectives and Advantages of PPC, Production procedure, functions of PPC, production consumptions cycle, centralised & decentralised PPC, Pre-requisite of PPC.

Unit II :- PRODUCTION FORCASTING :-
Introduction, definition and importance of forecasts, Qualitative model: Delphi techniques, Quantitative models: - Simple moving average, weighted moving average, simple experimental smoothing.
Forecasting error and selection of forecasting model. Types of forecasts: Constant, linear cycle forecaster, Verification and conrolling, The moving range chart, Average MR, out of control conditions.

UNIT III: PRODUCTION PLANNING :- The production order, Procedure for formulating Production order, master Program. Basic problems in production planning, Quantities in batch production, criteria for batch, size determination, minimum cost batch size, production range, Maximum profit Batch size, Maximum return, Rate of return, Economic Batch size.

SECTION – B
Unit IV : MACHINE OUTPUT :
Machine output, multi machine supervision by one operator, Machine interforcence, Ashcroft lables, average number of consecutive servicing task, the Ashcraft Number.

Unit V: ANALYTICAL STRUCTURE OF INVENTORY :- Definition of inventory, Types of inventory and the classification, structure of inventory problems and its analysis, the relevant cost, objectives of carrying inventories, selective inventory analysis.
Static Model :- General characteristic, incremental analysis, opportunity cost, cost of risk, decision criteria under uncertainty.

Unit VI: A) DYNAMIC MODEL :- CERTAINTY CASE :- General characteristic, optimum lot size model win constant demand, quantity discounts.
Risk Case :- General characteristics, P-system and Q-system.
B) Material Requirement planning (MRP) :- Introduction to MRP, Manufacturing Resource Planning (MRP-IT), just in time (JIT), comparasion of MRP, MRP-II, Enterprenership Resource Planning (ERP)

TEXT BOOKS:
1. Elements of Production Planning and Control by Simuel Eilon – Universal Publishing Corporation ltd.Mumbai
2. Production Control – John E.Biegal- Prentice Hall of India.
3. Inventory control, Theory & Practice- Start & Miller

REFERENCE BOOKS:
2. Production & Operation Mgmt.;- E.E.Adam, Jr.R.J.Ether, Prentics Hall of India.

8ME01 PROFESSIONAL ELECTIVE – II
(3) MANAGEMENT INFORMATION SYSTEM

SECTION - A
Unit I : Basis of MIS :
What is a system, what is information and data, necessity of prompt, accurate & relevent information for effective decision making, decision tables, Types of information, organisational structure and types of information within them, Fact gathering techniques. (8 Hrs.)

Unit II : System of Analysis & Design :
Phases of system development procedure, project request form system proposal, cost/benefit analysis functional specifications, detailed system descriptio, system acceptance criteria, audit and control requirments, structured system development, data flow diagram, context analysis diagram, exploding a process,
structured analysis, structured design, structure charts, coding schemes, input form design, system protection. (8 Hrs.)

Unit III: A) Development of MIS
Long Range plans of MIS, Class of Information, information requirement, implementation of MIS, Management of Quality in the MIS, Organisation for the development of MIS, Factors of success & failure of MIS.

B) Choice of Information Technology:
Nature of IT decision, Strategic decision, Configuration decision, Evaluation, IT implementation plan. (8 Hrs.)

SECTION – B

Unit IV: Introduction of MIS:
Prerequisites of Information System Technology Data base Management System: Concepts, Models, design, Performance monitoring & Turning, Security in the database environment MIS & RDBMS. DBMS Software ORACLE (8 Hrs)

Unit V: a) Decision Support Systems (DSS):
Concept & Philosophy AI, Knowledge based expert system, MIS & Role of DSS.
b) Enterprise Management System (EMS):
Introduction to ERP, basic feature, benefits, selection and implementation EMS & MIS.
c) Business process Re-engineering (BPR): Introduction, Business process, Process models of Organisation and value stream model of organization, MIS & BPR. (8 Hrs)

Unit VI: Application of MIS

B) Application in Service Sector like Hospitals, Airlines, Hotels, Banks, Insurance. (8 Hrs)

TEXT BOOKS:

1) Management Information System - W.S.Jawadekar (TMH, 2010)
2) Information Systems for operation & Mgmt.-Voichdan, Homer.
3) Management Information Systems - Ross.

8ME01 PROFESSIONAL ELECTIVE – II

(4) ADVANCED MANUFACTURING SYSTEMS

SECTION – A

Unit I: Total Quality Management(TQM): Understanding quality, commitment & leadership Customer satisfaction involvement
8ME02 PROFESSIONAL ELECTIVE – III
(1) REFRIGERATION & AIR CONDITIONING

SECTION – A

Unit I: Introduction to automotive air conditioning- Vapour compression system:- Analysis of simple vapour compression system. Use of pressure enthalpy. Temperature entropy charts. Effect of operating conditions such as evaporation and condensation pressure, superheating and sub cooling. Actual vapour compression system, Refrigerants :- classification: primary & secondary refrigerants, desirable properties of refrigerants; merits & demerits of commonly used refrigerants such as Ammonia R-12, R-22 and their selections and eco friendly refrigeration 134 a, HFC.

Unit II: Multi stage pressure systems:- multistage compression: choice of intermediate pressure, complete multi-stage compressions. Multi evaporator systems; single compression individual expansion value, single compression multi expansion valve, individual compressor multi expansion valves, cascade systems, its applications to cryogenics. Air liquefaction processes- Linde-Hampson (No numerical treatment to air liquefaction system) (10 Hours)

Unit III: Refrigeration systems components & controls:- brief study of refrigerants, compressor, condensers, evaporators, expansion valves, drier, fillers, selection criteria for the components of vapours compression systems Flow controls, temperature controls, pressure controls and safety devices. Defrosting systems, testing & charging of refrigeration systems, leak detection. (No analytical treatment is expected) (8 Hours)

SECTION – B

Unit IV: Psychromeric properties of moisair psychrometric chart, concept of thermodynamic wet bulb temperature, representations of Psychromeric process on Psychromeric charts, mixing of air, evaporating cooling, air washers. Human comfort:- metabolism of human body, factors influencing comfort, concept of effective temperature, optimum effective temperature & comfort charts. (7 Hours)

Unit V: Classification of air conditioning systems & applications. Unitary system package, window type & split type air conditioning. Central system:-System components, types:- direct expansion system, all water system & all air system. Water, summers & year round air conditioning. Transmission & distribution. Types of supply air ducts, consideration for selection & location of outlet, distribution partners of outlet, location of return air opening & introduction to duct design. (No numerical treatment is expected) (9 Hours)

Unit VI: Load calculation & applied Psychrometry-basic consideration at heat gains/losses sensible & latent, heat due to occupancy lightening, appliances, products, process, air conditioning systems, safety factor cooling load estimates, heating load estimates. Sensible heat factor by pass factor, apparatus dew point, effective sensible heat factor (8 Hours)

BOOKS RECOMMENDED:

TEXT BOOKS:
1. Refrigeration & air conditioning; C.P.Arora; Tata Mcgraw Hill publication.
2. Refrigeration & air conditioning; Arora, Domkundwar; Dhanpat Rai Publication.

REFERENCE BOOKS:
1. Principles of Refrigeration; J.Dossat; Pearson Education, Asia publication
2. Refrigeration & air conditioning- P.L.Balaney

8ME02 PROFESSIONAL ELECTIVE – III
(2) MACHINE TOOL DESIGN

SECTION – A

Unit I: General requirement of machine tool design kinematics of m/c tool :- Various driving systems used in machine tools, basic design consideration in the design of variable speed range in the machine tools, layout of speed in geometric, logarithmic & earthmatic progression saw diagrams, range ratio, graphical repesentation of speed on structural and ray diagrams, design of speed & feed boxes and their classification. (8 Hours)

Unit II: a) Mechanical, electrical, Hydraulic stepless regulation of speeds.
   b) Machine tool structure (bed, column, cross-rail) functions & their requirements design criteria for machine tool structure design procedure factors effecting stiffness for machine tool structure & their profile. (8 Hours)

Unit III: Static & dynamic rigidity, methods of increasing rigidity of structure, machine tool clasic system, procedure for assessing dynamic stability, dynamic charactorstics, single degree &
multidegree of freedom systems, Experimental determination of dynamic characteristics of m/c tool, dynamic characteristics of cutting process, statrility analysis, single degree, multidegree (8 Hrs)

SECTION – B
Unit IV: Vibrations of machine tools :- Effects vibration on m/c tool on cutting condsns, workpiece. Sources of vibrations, types of vibrations (forced, chatter, stickup vibrations) and its minimization.
Shock absorberm, isolated tool bioder, chatter in milling lathe, grinding, reduction of chatter in design & production stages. (8 Hrs)

Unit V: Machine tool guideways & slideways :- Functions, shapes of guideway, materials, methods of adjusting clearance inguideways, design of slideways for wear resistance, determination of maximum and average pressure, on slide way, Hydraulic guideway, antifriction guidway, protecting devices for slideway. (8 Hrs)

Unit VI: Machine tool spindle and bearings :- Functions, requirement, types and materials of spindle, machines tool compliance, design of spindle, antifriction bearing, performance indices, Hydrostatic journal bearing, hydrodynamic bearing. (8 Hrs)

BOOKS RECOMMENDED:
TEXT BOOKS:

REFERENCE BOOKS:
3. Design Principles of Metal î Kondsbeger Cutting Machine Tools

8ME02 PROFESSIONAL ELECTIVE-III (3) FINITE ELEMENT METHOD

SECTION - A

Unit II: Matrix Algebra & Gaussian Elimination : Matrix Multiplication, Transposition, Diagonal Matrix, Symetric Matrix, Upper Triangular Matrix, Determinant of Matrix, Matrix Inversion Eligen values & Elgenvectors, Gaussian elimination. (7 Hrs)

Unit III: ID Problems : Finite Element modeling, coordinate Shape function, The potential Energy appraoch, The Galerkinâ Approach, assemblies of the global stiffness matrix and loc vectors, Properties of stiffness Matrix, Treatment of boundary conditions, quadratic Shape Functions, Temperature Effects. (7 Hrs)

SECTION – B
Unit IV: 2D Problems for CST : Constant strain triangle, isoperimetric Representation, potential Energy energy approach, element stiffness, gallekinâ approach, temperature effects, problem modeling and boundary conditions. (7 Hrs)

Unit V: Development of equations: Truss equations, derivation of the stiffness, matrix for a bar element in local coordinate, global stiffness matrix, beam equation. Beam stiffness, example assemblage of beam stiffness matrix, plain stress & plain stress stiffness equations, basic concept of plain stress and plain strain, derivation of the CST stiffness matrix and equations Treatment of body and surface forces. (7 Hrs)

Fluid Flow : Derivation of the basic differential equations, Id Finite Element formulation, Computer Implementation (prepossessing, post processing, input data file, mesh generation)

BOOKS RECOMMENDED:
TEXT BOOKS:
1. Introduction to Finite Element Engineering î T.R.Chandrupatla, Belegunda; PHI
2. A First course in Finite Element Method- Darya Logon, Thompson Learning (TL Publisher)

REFERENCE BOOKS:
2. Fundamentals of Finite Element Method analysis î D.V.Huttan, Tata Mcgraw Hill
8ME02 PROFESSIONAL ELECTIVE - III
(4) ROBOTICS

SECTION – A

Unit I: Fundamentals of Robotics- Introduction, Automation & Robotics-robot applications robotic systems, robot anatomy and robot configurations, Joint types used in robots, robot wrists, joint notation schemes, work value for various robot anatomies, robot Specifications. (8 Hrs.)

Unit II: Robots end-effectors-classification of end-effectors, mechanical grippers, hooking or Lifting grippers, grippers for molten metals, plastics, vacuum cups, magnetic grippers Electrostatic grippers, multiple grippers, internal & external grippers, drive systems for grippers, active & passive grippers. (7 Hrs.)

Unit III: Robot drives & control-pneumatic power drives, hydraulic systems, electric drives, robot controllers-servo and non servo systems, motion control of robots, point to point and continuous path control, teaching of robots, robot programming methods. (7 Hrs.)

SECTION – B

Unit IV: Robot Sensors: Scheme of robotic sensors, contact type sensors, force, torque, touch, position, velocity sensors, non-contact type sensors, electro-optical imaging sensors, proximity sensors, range imaging sensors, robot environment and robot input/output interfaces, machine intelligence, safety measures in robots. (7 Hrs.)

Unit V: Robot Kinematics- Forward & reverse kinematics, forward and reverse transformation of two DOF & three DOF 2-D manipulator, homogeneous transformations.

Unit VI: Quantitative Techniques for economic performance of robots- Robot investment costs, robot operating expenses. methods of economic evaluation, method of pay-back period, return on investment method, discounted cash flow method. (7 Hrs.)

RECOMMENDED BOOKS:

TEXT BOOKS:
1) Robotics Technology & Flexible Automation by S.RDeb, Tata Mcgraw Hill.
2) Industrial Robotics by M.P Groover, McGraw Hill.

REFERENCE BOOKS:
3. Robotic Engineering by Richard D.Klafter, PHI.

8ME03 I.C. ENGINES

SECTION – A

UNIT I: Introduction to IC Engines and cycle analysis: Basic of I.C. Engines, Details of two stroke and four stroke engines, Air standard cycles, Fuel air cycle and actual cycle. Variation in specific heat, Dissociation and their effect on engine performance. Review of other losses in IC engines. (7 Hrs)

UNIT II: Fuels and alternative fuels: Conventional fuels for IC engines, requirement, properties, fuel additive, limitations of fossil fuels. Review of various alternative/non-conventional fuels. Studies of fuel injection systems: Fuel pump and their working, different types of fuel feed systems, studies of injectors nozzles, Bosch type fuel pump. (8 Hrs)

UNIT III: Combustion SI Engine: Stages of combustion, factors influencing various stages, Normal and abnormal combustion, Detonation. Factors responsible for detonation. Effect of detonation. Octane rating of fuel, Requirement of combustion chambers for SI engines, important types, relative advantages and disadvantages and application. (8 Hrs.)

SECTION - B

UNIT IV: Combustion in CI. Engines: Stages of combustion in CI Engines, Delay period, factor affecting delay period, diesel knock, cetane rating, Requirements of combustion chamber for CI Engines. Methods of generating turbulence in combustion chamber. Types of combustion chambers for CI Engies. (8 Hours)

UNIT V: Performance testing of IC Engines: Evaluation of various performance parameters of IC Engines including heat balance, sheet and excess air calculation. Methods of determination of friction power. Supercharging: Basic principles, objectives, arrangements for super charging, advantages and limitations of super charging (8 Hours)

UNIT VI: Emission from IC Engines: review, their effect on human health, cause of formation and approaches to control this pollutants. Study of BIS, EURO emission norms, IC Engines: Recent trends: Microprocessor based engines, management multi-point fuel
injection engines, common rail direct injections engines, variable valve timing engines. (8 Hours)

TEXT BOOKS:
1. Internal combustion Engines - M.L.Mathur & Sharma Dhanpatrai & Sons.
2. Internal combustion Engines by V.Ganeshan, Tata Mcgraw Hills.

REFERENCE BOOKS:
1. Internal combustion Engines Fundaments- John B. Heywood, Mcgraw Hills
2. Internal combustion Engines & Air Pollution- Obert E.F.Intext Educational.

8ME04 OPERATION RESEARCH TECHNIQUES

SECTION –A

Linear Programming : Formulation, Standard Form, Graphical and simplex methods. Primal-Dual relationship. (8 Hrs)

UNIT II: Transportation Models : Introduction, LP Formulation of transportation problems, Methods for finding initial solution, MODI method.

UNIT III: Network Models : Network construction, PERT analysis, CPM analysis, cost analysis & Crashing the network, Updating resources smoothing and leveling. (6 Hrs)

SECTIONS-B

UNIT IV: Waiting line models : Introduction, characteristics, classification, analysis of M/M/1 and M/M/s models.
Sequencing : processing of n jobs through two machines, n jobs through m machines, two jobs through m machines. (7 Hrs)

UNIT V: Replacement models : introduction, value of money, individual and group replacement policies.
Simulation : introduction, Monte Carlo simulation, advantages and limitations, applications of simulation to queuing models, inventory models, maintenance models , etc. (7 Hrs)

UNIT VI: Dynamic programming: introduction, characteristics, applications of dynamic programming to capital budgeting, production scheduling, travelling sales men, cargo loading problems, etc. (6 Hrs)

RECOMMENDED BOOKS:
TEXT BOOKS:

REFERENCE BOOKS:
1. Introduction to Research Operation, 7th Edition; Hiller/Lieberman; Tata Macgraw Hills.

8ME05 PROJECT & SEMINAR

8ME06 PROFESSIONAL ELECTIVE-III

(1) REFRIGERATION & AIR CONDITIONING - LAB.

List of Practicals :-
Any six of the following should be conducted and a report there of should be submitted
1. Trial on Vapour compression system.
2. Trial on Air-conditioning system.
3. Study of Electrolux system.
4. Study of Water cooler.
5. Study of window Air conditioner.
7. Study of desert cooler.
8. Study of cold storage plant.
10. Study of defrosting system.
11. Study/trial of ice plant.
12. Study of various refrigeration and air-conditioning controls.

Practical Examination:
It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE-III

(2) MACHINE TOOL DESIGN - LAB.

PRACTICALS :-
(1) Design of speed box.
(2) Design of feed box.
(3) Design of combination guide way.
SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL (ELECTRONICS & POWER) ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: SEVENTH

7 EP01/7EL01/7EE01 CONTROL SYSTEM - II

SECTION-A

Unit I: Compensation Techniques:

UNIT II: State Space Techniques I:
State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation - Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response - SISO Systems.

UNIT III: State Space Techniques II:
Concept - controllability and observability; SISO/MIMO Linear systems -Gilbert's method and Kalman's test; SISO controllable systems Design - state feedback.

SECTION-B

Unit IV: Sampled Data Control Systems:
Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis - open loop and closed loop sampled data systems, Z Transform functions, Difference equation solution and response; Z Transform Method. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Jury's Test and Bi-Linear Transformation, Root and root locus method.

Unit V: Non-Linear System Analysis I:
Non-linear system behavior - types and characteristics; Describing functions - typical non-linearity and their

(8) Design of Laths bed

Note: At least 6 practicals from above list should be done.

PRACTICAL EXAMINATION:-
It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE-III
(3) FINITE ELEMENT METHOD - LAB.

PRACTICAL EXAMINATION:-
It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE-III
(4) ROBOTICS – LAB.

PRACTICAL: The students are expected to perform 5 practicals based on the above syllabus

8ME07 I.C. ENGINES- LAB.
List of Experiments:
Any six of the following practical should be performed and
1. Performance test on a single cylinder diesel engine.
2. Performance test on a single cylinder petrol engine.
6. Trial on petrol/diesel engine to plot p-0 and p-V diagram.
9. Study of Bosch type single plunger fuel pump.
10. Study of various types of fuel injectors and nosels.
It shall consist of viva-voce based on term work and syllabus.

8ME08 OPERATION RESEARCH TECHNIQUES - LAB.
List of Practicals:-
At least 6 practical from above list should be done.
1. Formulation of LPP from real life situation.
2. Solution of LPP by using MS Excel.
3. Case study of transportation problems.
5. Case study on project network.
6. Case study on sequencing problems.
7. Constructing and solving the simulation model from real life situations.
8. Study of Replacement model through different problems.
9. Case study on dynamic programming problems.
External Pracitical Examination - Viva voce on the term work and syllabus.

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Unit VI : Non-Linear System Analysis II
Linearization - Around operating point; Singular points; Classification and Nature; Phase-plane method - non-linear systems analysis; Phase trajectories construction; analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

REFERENCE BOOKS:
2. D.Roy Choudhary, Modern Control Engineering, Prentice Hall of India Pvt Ltd. New Delhi.

7EP02/7EL02/7EE02 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I
Meaning of optimum scheduling, UCP and LSP; Input – Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A Generator Control Loops
Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)
Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control
Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area
Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system – Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities
Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

REFERENCE BOOKS:
Unit I: Symmetrical components
Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank - sequence voltages and currents relation; power system elements - sequence impedance and sequence networks; Various three phase transformer connections - zero sequence rules; Unbalanced load system - application.

Unit II: Symmetrical Fault Analysis
Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III: Unsymmetrical Fault Analysis
L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults - loaded and unloaded conditions.

SECTION-B

Unit I: Circuit Interruption

Unit II: Fuses Types, Constructional features, operation, Characteristics and Applications
B. Circuit Breaker (Part – I)
Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operation, characteristics and application.

Unit III: Circuit Breaker (Part – II)
SF6, Vacumm, Miniature, Earth leakage and Moulded Case types, Constructional features, operation and application; Testing, Instalation and Maintenance.

TEXT BOOKS -

REFERENCE BOOKS -

Unit IV: Overvoltages
Causes - internal and external; Voltage surge, Basic insulation level, Protection - earthing screen, overhead ground wire, lightning arresters.

Unit V: HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters - reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI: Flexible AC Transmission Systems (FACTS)
FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004

REFERENCE BOOKS -

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004

REFERENCES BOOKS -
Unit VI: A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying
Basic concepts, equipments, comparators, Characteristics realization overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

REFERENCE BOOKS:-
4. Geosonoviz î Ő High Voltage Circuit Breakers Ő
5. V. A. Slabikov î Ő Generation Protection and Switchgear Ő CIT, Coimbatore.
8. Handbook of switchgear by BHEL, TMH 6th reprint, 2010

7EP05/7EL05/7EE05/7EX05 PROFESSIONAL ELECTIVE - I
(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I: Electronics Instruments for Measurement of Electrical Parameters
Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II: Signal Generation and Analysis
Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: Signal Counting and Recording
Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

7EP05/7EX03 PROFESSIONAL ELECTIVE - I
(2) COMPUTER ORGANISATION

Unit-II: **Processing Unit**: fundamental concepts, execution of a complete instruction, hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: **I/O Organization**: accessing I/O devices, interrupts, direct memory access: bus arbitration. I/O hardware: processor bus and interfacing circuits, standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: **Memory Unit**: basic concepts, semiconductor RAM memories, internal organization, static & dynamic RAMs, ROMs. Speed, size & cost considerations. Cache memories: performance considerations. Virtual memories, address translation, memory management requirements.

Unit-V: **Arithmetic**: number representation. Design of fast adders, signed addition and subtraction. Multiplication of positive numbers, Booth's algorithm, integer division. Floating-point numbers and related operations.


**REFERENCES BOOKS**:  

**7EP05 / 7EL05 / 7EE05 PROFESSIONAL ELECTIVE - I**  
(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

**SECTION-A**

**Unit I**: **Representation of power systems for computerized analysis**: Mathematical models of synchronous generator for steady state and transient analysis. Transformer with tap changer, transmission line, phase shifter and loads.


**SECTION-B**

**Unit IV**: **Short circuit studies**: Three phase networks, Symmetrical components. Thevenin's theorem and short circuit analysis using bus impedance matrix. Short circuit calculations for balanced three phase networks using bus impedance matrix.


**Unit VI**: **Stability studies of power system**: Development of mathematical model for multimachine system stability analysis. Formation of equations and methods of solutions. Transient stability analysis including synchronous machines, system networks and loads. Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

**TEXT BOOKS**:  
1) L.P. Singh: Advanced Power System Analysis and Dynamics, WEL.  
2) Y.Wallach: Calculations and programs for Power System Network.  

**REFERENCE BOOKS**:  
1) R.N. Dhar: Computer Aided Power System Operation and Analysis, TMC.  
UNITI: Introduction
Biological Neurons and their artificial models, introduction to neural computing
Components of neuron, input and output weight, threshold, weight factors, transfer functions, concepts of supervised and unsupervised learning.

UNITII: Supervised Learning:
Single Layer network, perceptron, Linear Separability, Training algorithm and limitations.

UNITIII: Unsupervised Learning:
Introduction, Counter propagation networks, Kohonen's self-organizing maps.
Hopfield's networks.

UNITIV: Introduction:
Uncertainty in information, basic concepts of Fuzzy sets, operations on fuzzy sets, properties.
Fuzzy relations: operations, properties, value assignments.

UNITY: Membership Functions:
Features, fuzzification, membership value assignments, Fuzzy Rule based systems, Graphical technique of inference.
Defuzzification: Lambda-cuts for Fuzzy sets and Fuzzy relations, Defuzzification methods.

UNITVI: Genetic Algorithm (GA):
Introduction to genetic algorithm, working principle, coding of variables, Fitness function, GA operators, similarities & differences between GAs and Traditional methods; Unconstrained and constrained optimization using Genetic Algorithm, real coded GA, Advanced GA, global optimization using GA.

REFERENCES:
1. G.J. Khir and T.A. Folger: Fuzzy sets, Uncertainty and Information PHI Publication
2. Koska Bart: Neural Network & Fuzzy systems Prentice Hall of India Pvt Ltd., New Delhi

TEXT BOOKS
1. J.M. Zurada: Introduction to Artificial Neural Network, Jaico Publishing House
2. Meherotra Kishan, Mohan C.K., Ranka Sanjay: Elements Of Artificial Neural Networks, Penram Int Pub Mumbai
5. M. Kishan, Mohan C.K., Ranka Sanjay: Elements of Artificial Neural Networks, Penram Int. Publications
SECTION-B

Unit IV: Transient State Stability – I
Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II
Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System
Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage – time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXT BOOKS:

REFERENCE BOOKS:

8EP02/8EL02/8EE02/7EX05 (III) HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I: Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsend law, Streamer mechanism of spark path, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK:

REFERENCE BOOKS-
3. E.Kuffer and M.Abdulla _High Voltage Engineering, Pergamon Press
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) – High Voltage Engineering, Khanna Publications, Delhi.
8EP03/8EL03/8EE03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I: Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II: Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties, Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals—Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B


UNIT-V: Analog filter types, Butter worth, Elliptic filter, Specification formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications—DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:
2. Oppenham & Scheffer, Discrete Time Processing John Wiley Publication

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II

(1) ELECTRIC DRIVES & CONTROL

SECTION-A


UNIT-II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.


SECTION-B

UNIT-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, variable frequency control, Rotor resistance control, slip-power recovery scheme, Synchronous motor drive, Microprocessor controlled AC Drive.

UNIT-V: Vector controlled Drive, Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifier excator flux oriented v.c., v.c. of current fed inverter drive & cycloconverter drive servorless control speed estimation controls EKF method

UNIT-VI: Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissionig of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:
1. Power Electronics : (Converts, Application & Design) Mohan/Undeland/Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli TMH
UNIT I: Introduction

UNIT II: Power Quality Characteristics

UNIT III: Power Quality Standards

SECTION-B

UNIT IV: Power Quality Solutions

UNIT V: Wiring and Grounding

UNIT VI: Power Quality Measurement Tools & Power Quality Surveys
Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS:

REFERENCE BOOK:-
Unit IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management.


TEXT BOOK:

REFERENCE BOOKS:
2. Jane W. S. Liu, "Real Time Systems" Pearson Education

8EP04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II (4) GENERALISED MACHINE THEORY

SECTION A

Unit I: Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage flux, voltage and torque equations.

Unit II: Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.

Unit III: D.C. Machines: separately excited DC generators and motors formulation of mathematical model, steady state and transient analysis, Ward-Leonard system of speed control.

8EP05/8EL05/8EE05 PROJECT & SEMINAR

8EP06 DIGITAL SIGNAL PROCESSING - LAB

Any TEN experiments based on contents of 8EP03/8EL03/8EE03 DIGITAL SIGNAL PROCESSING

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Steady state analysis of DC series, shunt and compound machine and their characteristics cross-field machines, metadyne transformer, metadyne generator.

SECTION B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics. High torque cage motors- deep bar rotor and double cage rotor induction motors, steady state analysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and sharge motor and steady state analysis.

TEXT BOOKS:
2. SEEL Y: Electromechanical Energy Conversion
SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL & ELECTRONICS ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: SEVENTH

7EX01 UTILISATION OF ELECTRICAL ENERGY

SECTION-A

Unit I: Concept of electrical drive, classification, advantages of electrical drive, selection criteria for electrical motor, size, specification and type of motor, mechanical features of motor, transmission of drive, industrial application, general workshop, Textile mill, Paper mill, Coal mining, Sugar mill, Printing industry.

Unit II: Types of duties, continues, intermittent and short time, heating and colling of motor, rating calculations for these duties, use of fly wheel and fly wheel calculations. Introduction for conducting and reporting the test on induction motors as per Indian standard.

Unit III: Characteristics of DC motors, three-phase induction motors, single-phase induction motors. Quadrantal diagram of speed-torque characteristics of motors, starting methods, different methods of speed control, braking of motors, plugging, rheostatic and regenerative braking.

SECTION-B

Unit IV: Requirement of ideal traction system, system of track electrification and their comparison, speed time curves, energy consumption calculation, calculation of tractive efforts.

Unit V: Traction motors, general features and types, characteristics, control of locomotive motor coaches, series-parallel control. Overhead equipments, collector gear for overhead equipments.

Unit VI: a) Nature of light-units, luminous efficiency, Glare production of light, Polar curves, control of light by reflection, refraction and diffusion. Lighting calculations, factory lighting, flood lighting, street lighting. b) Methods of heating and welding furnaces

TEXT BOOKS:

REFERENCE BOOKS:
3) Specification of Three Phase Induction Motors as per Indian Standard, published by Indian Standard Institute, New Delhi.

7EX02 ELECTRONIC COMMUNICATION

Unit I: Signal and Noise: - Audio signals, frequency range speech and music, sound intensity, loudness, level, frequency response, bandwidth, bandwidth requirement for different types of signals such as telegraph, telephone speech, music and video Noise: External and internal noise, noise figure, signal to noise ratio, noise figure measurement.

Unit II: Modulation Techniques: - Amplitude modulation theory, Frequency spectrum representation of AM, Modulation index side bands, power relations, current relations and voltage relation in the AM wave. Frequency modulation and phase modulation, frequency deviation, modulation index, frequency spectrum.


Unit IV: AM Receivers: - TRF receiver, superhetrodyne receiver, details of each block such as RF amplifier, Oscillator, IF amplifier, Diode detector, audio amplifier. Mixer: Principle, Need and type of AGC, Practical radio receiver circuit with AGC, characteristics such as selectivity, sensitivity, and fidelity communication receiver.

Unit V: FM Transmitter: - Circuits for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow band and wide band FM, their comparison, de-emphasis and pre-emphasis. FM transmitter & stereo FM transmitter.

Unit VI: FM Receivers: - Details of FM receiver, blocks such as RF amplifier, local oscillator, IF amplifier, Mixer, audio Ampl. AGC, limiter, FM discriminator, single slope and balanced slope detector, analysis of Foster seeley and ratio detectors, stereo FM receiver.
7EX03 COMPUTER ORGANISATION

Unit-I: Basic structure of a computer: Hardware & software, Addressing methods, Program sequencing, concept of memory locations & address. Main memory operation, Instructions & instruction sequencing, Addressing modes, Basic I/O operations, Stacks, Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts, execution of a complete instruction, hardwired control, performance consideration, Microprogrammed control, microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organization: accessing I/O devices, interrupts, direct memory access, bus arbitration, I/O hardware, processor bus and interfacing circuits, standard I/O interfaces, SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts, semiconductor RAM memories, internal organization, static & dynamic RAMs, ROMs, speed, size & cost considerations, Cache memories, performance considerations, Virtual memories, address translation, memory management requirements.

Unit-V: Arithmetic; number representation, design of fast adders, signed addition and subtraction, Multiplication of positive numbers, Booth’s algorithm, Integer division, Floating-point numbers and related operations.


7EX04 POWER ELECTRONICS - II

SECTION-A

UNIT-I: Introduction to Electrical Drives: Concept, Classification and Advantages, Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters, Types of mechanical loads, Selection of motor and Controller, Classes of duty, Stability of an electrical drive, Comparison of AC and DC drives.

UNIT-II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting, Types, advantages, limitations and purposes/objectives of electrical braking, Braking of DC and induction motors.

UNIT-III: DC Drive Control, Basic machine equations, scheme of control, Single phase separately excited drives, single phase series motor drives, power factor improvement, Three-phase separately excited drives, Closed loop control, PLL control, microcomputer control.

SECTION-B

UNIT-IV: AC drive control, Basic principle of operation, Speed control of induction motor, Stator voltage control, Variable frequency control, Rotor resistance control, Slip-power recovery scheme, Synchronous motor drive, Microprocessor controlled AC Drive.

UNIT-V: Vector controlled Drive, Principle of Vector Control, Equivalent Ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifier exciter flux oriented v.c., v.c. of current fed inverter drive & cycloconverter drive servosless control speed estimation controls, EKF method.
UNIT VI Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive. Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:
1. Power Electronics : ( Converts, Application & Design) Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli TMH
3. Power Electronics : M.H. Rashid Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education

7EX05 PROFESSIONAL ELECTIVE - I
(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I: Electronics Instruments for Measurement of Electrical Parameters
Advantages of Electronic Instruments, Electronic Voltmeters
Electronic Multimeters, differential volt meter, Digital voltmeter,
Q meter, vector impedance meter, vector voltmeter.

Unit II: Signal Generation and Analysis
Signal generators, Function generators. Wave analyzer
Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: Signal Counting and Recording:
Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital
display, universal counter, Digital readot devices, storage type
CRO, Servotype X-Y recorder.

SECTION-B

Unit IV: Signal conditioning and Conversions:
Frequency characteristics of various types of signals,active
filters bandpass,low pass and high pass filters using opAmps.
Various techniques od A/D and D/A conversions. Modulation
and demodulation PCM techniques, phase locked loop.

Unit V: Signal Processing:
Pulse times, triggered elayed sweeps, discrete pulse delay circuits,
pulses eqencing, analog multiplexers and demultiplexers, digital
multiplexing sample and hold circuits, serial and parallel digital
data conversion. Signal transmission, Analog and digital
telemetry techniques, MODEM and UART, keyboard and
character generators, tape recorder.

Unit VI: Introduction to Processor and Processor based Techniques.
Introduction to PLC, PLC architecture, programming; ladder
diagram and examples, micro controller based instrumentation

TEXTBOOKS:
1. H.S. Kalsi Electronic Instrumentation, - Tata Mc-Graw Hill Publishing
   Company, New Delhi.
2. Cooper, Helfrick Electronic Instrumentation and Measurement
   Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS:
   Ltd. New Delhi.

SECTION-B


TEXT BOOKS:
1) L.P.Singh: Advanced Power System Analysis and Dynamics, WEL.
2) Y.Wallach: Calculations and programs for Power System Network.

REFERENCE BOOKS:
1) R.N.Dhar: Computer Aided Power System Operation and Analysis, TMC.
2) M.A. Pai: Computer Techniques in Power System Analysis, TMH

7EX05 PROFESSIONAL ELECTIVE - I
(3) HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I: Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsend's law, Streamer mechanism of spark pashan law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing - Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK:

REFERENCE BOOKS:
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) _High Voltage Engineering, Khanna Publications, Delhi.
UNIT I: Fundamentals of Wind Turbines
- Power Contained in Wind, Thermodynamics of Wind Energy
- Efficiency Limit for Wind Energy Conversion, Maximum Energy Obtainable for a Thrust-operated Converter
- Efficiency Limit for a Thrust-tilted Converter
- Types of Wind Energy Conversion Devices: Dutch Windmills, Multiblade Water-tilted pumping Windmills, High-speed Propeller type Wind Machines
- The Savonius Rotor, The Darrieus Rotor

UNIT II: Wind Site Analysis and Selection
- Wind Speed Measurements: Robinson Cup Anemometer, Pressure Tube Anemometer, Hot Wire Anemometer, Wind Speed Statistics
- Statistical Wind Speed Distributions, Site and Turbine Selection

UNIT III: Basics of Induction and Synchronous Machines
- The Induction Machine, Constructional Features, Steady-state Equivalent Circuit Model, Performance Characteristics, Saturation Characteristics, Modified Equivalent Circuits, Effect of Rotor-injected Emf
- Slip Power Recovery Scheme, Dynamic d-q Axis Model

UNIT IV: Grid-connected and Self-excited Induction Generator Operation
- Constant-voltage, Constant-frequency Generation, Single-output System

UNIT V: Generation Schemes with Variable-speed Turbines
- Classification of Schemes, Operating Area Induction Generators, Cage Rotor Induction Generator, Doubly Fed Induction Generator, Wound-field Synchronous Generator, The Permanent Magnet Generator

UNIT VI: Hybrid Energy System


7EX06 PROJECT & SEMINAR

7EX07 UTILISATION OF ELECTRICAL ENERGY - LAB
- Any TEN experiments based on contents of 7EX01 UTILISATION OF ELECTRICAL ENERGY

7EX08 COMPUTER ORGANIZATION - LAB
- Any TEN experiments based on contents of 7EX03 COMPUTER ORGANIZATION

7EX09 POWER ELECTRONICS - LAB
- Any TEN experiments based on contents of 7EX04 POWER ELECTRONICS - II

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SEMESTER: EIGHTH

8EX01 POWER SYSTEM OPERATION & CONTROL

SECTION A

UNIT I: Economic Operation – Part I
- Meaning of optimum scheduling, UCP and LSP; Input-tilted Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

UNIT II: Economic Operation – Part II
- Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.
Unit III: A. Generator Control Loops
Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)
Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV: Automatic Load Frequency Control
Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V: Control Area
Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system Dynamic response; Tie-line bias control.

Unit VI: Steady-State Instabilities
Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS:

REFERENCE BOOKS:

5. Wood and Wollenberg — Power Generation, Operation and Control — Willey — Inter Science Publication

SECTION-A

Unit I: Circuit Interruption

Unit II: A. Fuses — Types, Constructional features, operation, Characteristics and Applications
B. Circuit Breaker (Part I)
Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operation and application.

Unit III: Circuit Breaker (Part II)
SF6, Vacuum, Miniature, Earth leakage and Moulded Case types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

Unit IV: A. Relaying Principle
Components, Essential features, Characteristics, Terminology, CT’s and PT’s, Relay classification.
B. Electromagnetic Relays
Overcurrent, Directional, Distance and Differential types, Constructional features, operation and characteristics and application.

Unit V: Protection of Transmission Lines
Relaying schemes — overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI: A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.
B. Static Relaying
Basic concepts, equipments, comparators, Characteristics realization — overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:
**REFERENCE BOOKS:**

5. V. A. Slabikov — *Generation Protection and Switchgear* CIT, Coimbatore.
8. Handbook of switchgear by BHEL, TMH 6th reprint, 2010

**TEXT BOOK:**


**REFERENCE BOOKS:**

1. Rajkamal — *Embedded Systems, Architecture, Programming & Design* TMH.

**8EX03 EMBEDDED SYSTEMS**

**Unit-I:** Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

**Unit-II:** Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Architecture (ISA) architecture model, internal processor design and its performance.


**Unit-IV:** Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management.


**Unit-VI:** Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture.

**8EX04 PROFESSIONAL ELECTIVE - II**

**8EX04 POWER SYSTEM MANAGEMENT**

**SECTION-A**

**UNIT-I:** Principle and Practice of Management:
- Basic Concepts - basic concepts of management, role and importance of management in modern society, management as a profession.
- The Process of Management - The process of management: planning, organizing, directing, controlling, decision-making, leading etc.
- Management Concepts - Managerial authority and responsibility-delegation and decentralization - Line and staff concepts - concepts in e-commerce etc.

**UNIT-II:** Marketing & Production/Operation Management:
- Marketing Management - Introduction to Marketing, Marketing strategy, Consumer Behaviour, Marketing Research, Product/Services Decisions, Pricing Products/Services, Distribution management, Advertising & Sales promotion etc.
- Production/Operation Management - Introduction to Production Planning and Process, Issues in Material and Inventory Management, Quality control and Management (quality circle, ISO 9000 series, just-in-time, TQM.), Maintenance Management, Purchasing Decision.

**UNIT-III:** Project, Financial & Human Resource Management:
- Financial Management - Costing - Principles, types - operating, marginal, incremental, embedded etc, Budgeting & financial planning, Risk management etc.
**Human Resource Management**: Human resource planning concepts & process, Job analysis & description recruitment, selection process, Training & development, Employee welfare, issues related to management of trade union.

**SECTION-B**

**UNIT-IV: Dimensions of Power System Restructuring**

*Power system Restructuring*: Introduction to Power Sector Reforms/Restructuring/ Deregulation issues, prospects and lessons to developing countries

*Environmental dimensions in power sector*: Pollution & Depletion of natural resources, Waste Management, environmental legislation, green power, strategies for environmental management in power sector.

*Rural Electrification*: Issues relating to revised definition of village electrification, issues in electrifying remaining villages, decentralized generation and distribution for rural electrification etc.


**UNIT-V: Management issues in Power Sector**

*Financing of power sector*: Financial problems of SEBs, strategies - for financing capacity addition to generation, transmission and rural electrification, Risk management in power sector.

*Human Resource development in power utilities*: Change management, Training & Development, Culture of empowerment and accountability etc.


**UNIT-VI: Marketing issues in Power Sector**


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**TEXT BOOKS:**

2. Muhlemann, Production Operation Management, Macmillan publication
5. Ramaswamy & Namakumari, Marketing Management Macmillan Publication
6. Philip Kotler, Marketing Management, PHI, New Delhi

**REFERENCE BOOKS:**

2. Fundamentals of Power System Economics, by Daniel S. Kirschen, Goran Strabac
4. Power System Economics, by Steven Stoft
6. Electricity Economics, by Geoffrey Rothwell, Tomas Gomez
11. India’s Power Sector Reforms Update, Paryas, Pune

**8EX04 PROFESSIONAL ELECTIVE - II**

(2) FUZZY LOGIC & CONTROL

**SECTION - A**

**UNIT - I: THE MATHEMATICS OF FUZZY CONTROL:**

Basic definitions, a-level sets, comparison with classical (crisp) sets Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, Fuzzy complements, t-norms, t-conorms, combination of operations, aggregation operations of fuzzy relations, the extension principle

**UNIT –II: THEORY OF APPROXIMATE REASONING:**

Fuzzy numbers, linguistic variables, arithmetic operations on intervals, arithmetic operations on fuzzy numbers, lattice of fuzzy numbers, fuzzy equations.
Linguistic variables, Fuzzy proportions, Fuzzy if-then statements, inference rules, compositional rule of inference.

**Unit-III: Fuzzy Relations:** Crisp versus fuzzy relation, projections and cylindric extensions, binary fuzzy relations, binary relations on a single set, fuzzy equivalence relations, fuzzy compatibility and fuzzy ordering relations.

**Possibility Theory:** Fuzzy measures, evidence theory, possibility theory, fuzzy sets and possibility theory.

**SECTION - B**

**Unit-IV: Fuzzy Logic:** An overview of classical logic, multi-valued logic, fuzzy propositions, fuzzy quantifiers, linguistic hedges, inference from conditional fuzzy propositions, inference from conditional and qualified propositions.

**NON-LINEAR FUZZY CONTROL:** FKBC as a linear transient element, PID like FKBC, sliding mode FKBC, Sugeno FKBC.

**Unit-V: FUZZY KNOWLEDGE BASED CONTROLLERS (FKBC):** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures. Simple applications of FKBC (washing machines, traffic regulations, lift control, etc).

**UNIT VI: ADAPTIVE FUZZY CONTROL:** Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
3. Fuzzy Logic Intelligence Control And Information- Yen- Pearson education.

**8EX04 PROFESSIONAL ELECTIVE - II**

**3 RPC & FACTS CONTROLLER**

**UNIT-I:** CONTROL OF VOLTAGE AND REACTIVE POWER

Introduction, Generation and absorption of reaction power, relation between voltage, power and reactive power at a node, methods of voltage control. Injection of reactive power, use of tap changing transformers, combined use of tap changing transformers and reactive power injection.

**Unit II:** Introduction to FACTS- Basic Types of FACTS controllers, Description and definition of FACTS controllers ï Benefits from FACTS technology- Static Var Compensator (SVC): Principle of operation, configuration and control, Thyristor Controlled Series compensator (TCSC): Principle of operation, configuration and control, Application of TCSC for damping electromechanical Oscillations, Application of TCSC for mitigation of SSR ï


**Unit IV:** Oscillation Stability Analysis and Control: Introduction ï Linearised model of power systems installed with FACTS based Stabilisers ï Heffron-Phillips model of a SMIB system installed with SVC, TCSC and TCPS ï Heffron-Phillips model of a SMIB system with UPFC ï Heffron-Phillips model of a Multimachine system installed with SVC, TCSC and TCPS.

**Unit V:** Analysis and Design of FACTS based stabilisers: Analysis of damping torque contribution by FACTS based stabilisers installed in SMIB systems, Design of robust FACTS based stabilisers installed in SMIB systems by phase compensation method - Selection of installing locations and feedback signal for FACTS based stabilizers.

**Unit VI:** Transient Stability control with FACTS: Introduction ï Analysis of power systems installed with FACTS devices: Power transmission control using Controllable Series Compensation (CSC), Power Transmission Control using SSSC, Power Transmission Control using UPFC, Power Transmission Control using Phase Shifting Transformer (PST), Power Transmission Control using UPFC, Control of FACTS devices for transient stability improvement ï General considerations of FACTS control strategy: CSC, SSSC, SVC, STATCOM and UPFC control strategy ï General Structure of the FACTS devices control.
REFERENCE BOOKS:-

8EX04 PROFESSIONAL ELECTIVE - II (4) POWER QUALITY

SECTION - A

Unit I: Introduction
Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics
Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards

SECTION - B

Unit IV: Power Quality Solutions
Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding

Unit VI: Power Quality Measurement Tools & Power Quality Surveys
Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS:-

REFERENCE BOOK:-

8EX05 PROJECT AND SEMINAR
8EX06 EMBEDED SYSTEMS - LAB
Any TEN experiments based on contents of 8EX03 EMBEDED SYSTEMS

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL (ELECTRICAL & POWER) ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: SEVENTH
7 EL01/7EP01/7EE01 CONTROL SYSTEM - II
SECTION-A

Unit I: Compensation Techniques:

Unit II: State Space Techniques I:
State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation - Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response - SISO Systems.

Unit III: State Space Techniques II:
Concept - controllability and observability; SISO/MIMO Linear systems -Gilbert method and Kalman test; SISO controllable systems Design -state feedback.

SECTION-B

Unit IV: Sampled Data Control Systems:
Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis - open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method, Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Jury Test and Bi-Linear Transformation, Root and root locus method.

Unit V: Non-Linear System Analysis I
Non-linear system behavior types and characteristics; Describing functions - typical non-linearity and their characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Unit VI: Non-Linear System Analysis II
Linearization - Around operating point; Singular points Classification and Nature; Phase-plane method - non-linear systems analysis; Phase trajectories construction analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

REFERENCE BOOKS:
2. D.Roy Choudhary, Modern Control Engineering, Prentice Hall of India Pvt Ltd. New Delhi.

7 EL02/7EP02/7EE02 POWER SYSTEM OPERATION & CONTROL
SECTION-A

Unit I: Economic Operation – Part I
Meaning of optimum scheduling, UCP and LSP; Input - Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II: Economic Operation – Part II
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III: A. Generator Control Loops
Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.
B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV: Automatic Load Frequency Control

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V: Control Area

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system: Dynamic response; Tie-line bias control.

Unit VI: Steady-State Instabilities

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS:


REFERENCE BOOKS:

5. Wood and Wollenberg – Power Generation, Operation and Control ï Inter Science Publication

SECTION-B

Unit I:: Symmetrical components

Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements: sequence impedance and sequence networks; Various three phase transformer connections: zero sequence rules; Unbalanced load system application.

Unit II: Symmetrical Fault Analysis

Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III: Unsymmetrical Fault Analysis

L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

UNIT IV: Overvoltages

Causes: internal and external; Voltage surge, Basic insulation level, Protection: earthing screen, overhead ground wire, lightning arresters.

Unit V: HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters: reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

UNIT VI: Flexible AC Transmission Systems (FACTS)

FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

TEXT BOOKS:

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004

REFERENCE BOOKS:-

SECTION-A

Unit I: Circuit Interruption

Unit II: A. Fuses Types, Constructional features, operation, Characteristics and Applications
B. Circuit Breaker (Part I)
Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operation and application.

Unit III: Circuit Breaker (Part – II)
SF6, Vacuum, Miniature, Earth leakage and Moulded Case types, constructional features, operation and application; Testing, Installation and Maintenance.

SECTION-B

Unit IV: A. Relaying Principle
Components, Essential features, Characteristics, Terminology, CTs and PTs, Relay classification.
B. Electromagnetic Relays
Overcurrent, Directional, Distance and Differential types, constructional features, operation, characteristics and application.

Unit V: Protection of Transmission Lines
Relaying schemes overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

UNIT VI: A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.
B. Static Relaying
Basic concepts, equipments, comparators, Characteristics realization overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

REFERENCE BOOKS:-
2. C. R. Mason "The Art and Science of Protective Relaying"
4. Geosonoviz "High Voltage Circuit Breakers"
5. V. A. Slabikov "Generation Protection and Switchgear" CIT, Coimbatore.
8. Handbook of switchgear by BHEL, TMH 6th reprint, 2010

SECTION-A

Unit I: Electronics Instruments for Measurement of Electrical Parameters
Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital volt meter, Q meter, vector impedance meter, vector voltmeter.

Unit II: Signal Generation and Analysis
Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: Signal Counting and Recording
Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital display, universal counter, Digital readout devices, storage type CRO, Servotype X-Y recorder.
SECTION-B

Unit IV : Signal conditioning and Conversions.
Frequency characteristics of various types of signals, active filters bandpass, low pass and high pass filters using opAmps. Various techniques of A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: Signal Processing
Pulse times, triggered delayed sweeps, discrete pulse delay circuits, pulses queueing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder.

Unit VI: Introduction to Processor and Processor based Techniques.
Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS: -

REFERENCE BOOKS: -

7 EL05/7EP05/7EX03 PROFESSIONAL ELECTIVE - I
(2) COMPUTER ORGANISATION


Unit-II: Processing Unit: fundamental concepts, execution of a complete instruction, hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organization: accessing I/O devices, interrupts, direct memory access, bus arbitration. I/O hardware: processor bus and interfacing circuitry, standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts, semiconductor RAM memories, internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations. Cache memories: performance considerations. Virtual memories, address translation, memory management requirements.

Unit-V: Arithmetic: number representation, design of fast adders, signed addition and subtraction. Multiplication of positive numbers, Booth's algorithm, Integer division. Floating-point numbers and related operations.


TEXT-BOOK:

REFERENCE BOOKS:

7 EL05/7EP05/7EE05 PROFESSIONAL ELECTIVE - I
(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION-A

Unit-I: Representation of power systems for computerized analysis: Mathematical models of Synchronous generator for steady state and transient analysis. Transformer with tap changer, transmission line, phase shifter and loads.

Unit-II: Topology of Electric Power Systems Network Graphs, Incidence matrices, fundamental loop and cutset matrices, primitive


SECTION-B


TEXT BOOKS:
1) L.P. Singh: Advanced Power System Analysis and Dynamics, WEL.
2) Y. Wallach: Calculations and programs for Power System Network.

REFERENCE BOOKS:
1) R.N. Dhar: Computer Aided Power System Operation and Analysis, TMC.
SECTION-A

Unit I: Basic Concepts
Meaning of stability, Steady state, Transient and Dynamic stability limits; Three Phase Synchronous Machine-circuit representation, voltage equation and Park’s Transformation; Transient and Sub transient state analysis and Phasor diagrams, Voltage behind the transient and sub transient impedances, Parameters and Time Constants determination.

Unit II: Steady State Stability - I
Steady state stability limit-short transmission line, Two machines system, Medium and Long transmission line, Clarke& diagrams for system with and without loss, Effect of inertia, Conservative criterion, Synchronizing coefficients and Multi machine system.

Unit III: Steady State Stability – II
Saturation effect, Saturated reactance, Equivalent reactance and its graphical determination; Short circuit ratio, Governor action and automatic voltage regulator effects.

SECTION-B

Unit IV: Transient State Stability – I
Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II
Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System
Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage – time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXT BOOKS

REFERENCE BOOKS:

8 EL 02/8EP02/8EE02 HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I: Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsend law, Streamer mechanism of spark pashan & law, Corona discharge, Electronegative gases.
Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V. Lines Design.
Basic terminology, Testing Thrust Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK:

REFERENCE BOOKS-
1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) - High Voltage Engineering, Khanna Publications, Delhi.


8 EL 03 /8EP03/8EE03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I: Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II: Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties, Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B


UNIT-V: Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:
1. Proakis & Monolakis D.G, Digital Signal Processing@ PHI Publication
2. Oppenhavm & Scheffer, Discrete Time Processing@ John Wiley Publication
SECTION-A


UNIT III: DC Drive Control Basic machine equations, Schwefel of control, Single phase separately excited drives, single-phase series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, variable frequency control, Rotor resistance control, slip-power recovery scheme, Synchronous motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive, Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifier exator flux oriented v.c., v.c. of current fed inverter drive & cycloconverter drive servosless control speed estimation controls EKF method

UNIT VI: Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissioning of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:
1. Power Electronics : ( Converts, Application & Design) Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli TMH
3. Power Electronics : M.H. Rashid Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V:  Wiring and Grounding

Unit VI: Power Quality Measurement Tools & Power Quality Surveys
Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS:

REFERENCE BOOK:

8 EL 04/8EP04/8EE04  PROFESSIONAL ELECTIVE -II
(3) EMBEDED SYSTEMS

Unit-I: Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II: Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Architecture (ISA) architecture model, internal processor design and its performance.


Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management.


TEXT BOOK:

REFERENCE BOOKS:
1. Rajkamal, Embedded Systems, Architecture, Programming & Design TMH.
2. Jane W. S. Liu Real Time Systems Pearson Education

8 EL 04/8EP04/8EE04  PROFESSIONAL ELECTIVE -II
(4) GENERALISED MACHINE THEORY

SECTION-A

Unit I: Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage fluge, voltage and torque equations.

Unit II: Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.

SECTION-B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics. High torque cage motors- deep bar rotor and double cage rotor induction motors, steady state analysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and synchronous motor and steady state analysis.

TEXT BOOKS:
2. SEELY: Electromechanical Energy Conversion

8 EL05/8EP05/8EE05 PROJECT & SEMINAR

8 EL06/8EP06/8EE06 DIGITAL SIGNAL PROCESSING - LAB

Any TEN experiments based on contents of
8 EL03/8EP03/8EE03 DIGITAL SIGNAL PROCESSING

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characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Unit VI: Non-Linear System Analysis II
Linearization - Around operating point; Singular points Classification and Nature; Phase-plane method - non-linear systems analysis; Phase trajectories construction analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

REFERENCE BOOKS:
2. D.Roy Choudhary, Modern Control Engineering, Prentice Hall of India Pvt Ltd. New Delhi.

7 EE02/7EP02/7EL02 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I: Economic Operation – Part I
Meaning of optimum scheduling, UCP and LSP; Input Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II: Economic Operation – Part II
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III: A. Generator Control Loops
Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)
Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV: Automatic Load Frequency Control
Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V: Control Area
Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system Dynamic response; Tie-line bias control.

Unit VI: Steady-State Instabilities
Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

REFERENCE BOOKS:
5. Wood and Wollenberg - Power Generation, Operation and Control i Willey i Inter Science Publication
Section A

Unit I: Symmetrical Components

Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements – sequence impedance and sequence networks; Various three phase transformer connections – zero sequence rules; Unbalanced load system – application.

Unit II: Symmetrical Fault Analysis

Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III: Unsymmetrical Fault Analysis

L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

Section B

Unit I: Circuit Interruption


Unit II: Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operation and application.

Unit III: Circuit Breaker (Part – II)

SF₆, Vacuum, Miniature, Earth leakage and Moulded Case – types, Constructional features, operation and application; Testing, Instalation and Maintenance.

Section B

Unit IV: A. Relaying Principle

Components, Essential features, Characteristics, Terminology, CT’s and PT’s, Relay classification.

B. Electromagnetic Relays

Overcurrent, Directional, Distance and Differential – types, constructional features, operation, characteristics and application.

Unit V: Protection of Transmission Lines

Relaying schemes – overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.
Unit VI: A. Other Power System Elements Protection
Transformers, Motors, Generators and Buses.

B. Static Relaying
Basic concepts, equipments, comparators, Characteristics
realization i overcurrent, directional, differential and distance
relay. Microprocessor based relay introduction.

TEXT BOOK:-
   New Delhi

REFERENCE BOOKS:-
2. C. R. Mason ų The Art and Science of Protective Relaying ų
4. Georonoviz ų High Voltage Circuit Breakers ų
5. V. A. Slabikov ų Generation Protection and Switchgear ų CIT, Coimbatore.
8. Handbook of switchgear by BHEL, TMH 6th reprint, 2010

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I
(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I: Electronics Instruments for Measurement of Electrical Parameters
Advantages of Electronic Instruments, Electronic Voltmeters
Electronic Multimeters, differential volt meter, Digital voltmeter,
Q meter, vector impedance meter, vector voltmeter.

Unit II: Signal Generation and Analysis
Signal generators, Function generators. Wave analyzer Harmonic
Distorsion Analysers, spectrum Analysis.

Unit III: Signal Counting and Recording
Decade counting Assembly, Binary counter, Decimal counter,
Decade counter with digital disaply, universal counter, Digital
readot devices, storage type CRO, Servotype X-Y recorder.

Section-B

Unit IV: Signal conditioning and Conversions.
Frequency characteristics of various types of signals, active
filters bandpass, low pass and high pass filters using opAmps.
Various techniques od A/D and D/A conversions. Modulation
and demodulation PCM techniques, phase locked loop.

Unit V: Signal Processing
Pulse times, triggered elayed sweeps, discrete pulse delay circuits,
pulses sequencing, analog multiplexers and demultiplexers, digital
multiplexing sample and hold circuits, serial and parallel digital
data conversion. Signal transmission, Analog and digital
telemetry techniques, MODEM and UART, keyboard and
character generators, tape recorder.

Unit VI: Introduction to Processor and Processor based Techniques.
Introduction to PLC, PLC architecture, programming; ladder
diagram and examples, micro controller based instrumentation

TEXT BOOKS:-
1. H. S. Kalsi ų Electronic Instrumentation, ų Tata Mc-Graw Hill Publishing
   Company, New Delhi.
2. Cooper, Helfrick ų Electronic Instrumentation and Measurement
   Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS:-

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I
(2) COMPUTER ORGANISATION

Unit I: Basic structure of computer: Hardware & software. Addressing
methods. Program sequencing, concept of memory locations &
address. Main memory operation. Instructions & instruction
Queues & subroutines.
Unit-II: Processing Unit: fundamental concepts, execution of a complete instruction, hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.


Unit-IV: Memory Unit: basic concepts, semiconductor RAM memories, internal organization, static & dynamic RAMs, ROMs. Speed, size & cost considerations. Cache memories: performance considerations. Virtual memories, address translation, memory management requirements.

Unit-V: Arithmetic: number representation, design of fast adders, signed addition and subtraction. Multiplication of positive numbers, Booth’s algorithm, Integer division. Floating-point numbers and related operations.


TEXT-BOOK:

REFERENCES:

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I
(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION-A

Unit I: Representation of power systems for computerized analysis: Mathematical models of Synchronous generator for steady state and transient analysis, Transformer with tap changer, transmission line, phase shifter and loads.


SECTION-B


TEXT BOOKS:
1) L.P. Singh: Advanced Power System Analysis and Dynamics, WEL.
2) Y. Wallach: Calculations and programs for Power System Network.

REFERENCE BOOKS:
1) R.N. Dhar: Computer Aided Power System Operation and Analysis, TMC.
UNIT I: Introduction
Biological Neurons and their artificial models, introduction to neural computing
Components of neuron, input and output weight, threshold, weight factors, transfer functions, concepts of supervised and unsupervised learning.

UNIT II: Supervised Learning:

UNIT III: Unsupervised Learning:

SECTION-B

UNIT IV: Introduction:
Uncertainty in information, basic concepts of Fuzzy sets, operations on fuzzy sets, properties. Fuzzy relations: operations, properties, value assignments.

UNIT V: Membership Functions:

UNIT VI: Genetic Algorithm (GA):
Introduction to genetic algorithm, working principle, coding of variables, Fitness function, GA operators, similarities & differences between GAs and Traditional methods. Unconstrained and constrained optimization using Genetic Algorithm, real coded GA, Advanced GA, global optimization using GA.

TEXT BOOKS
1. J.M. Zurada: Introduction to Artificial Neural Network, Jaico Publishing House

REFERENCE BOOKS
1. G.J. Khir and T.A. Folger: Fuzzy sets, Uncertainty and Information, PHI Publication
2. Koska Bart: Neural Network & Fuzzy systems, Prentice Hall of India Pvt Ltd, New Delhi

7 EE06/7EP06/7EL06 PROJECT & SEMINAR
7 EE07/7EP07/7EL07 ELECTRICAL POWER II - LAB
Any TEN experiments based on contents of 7EE03 ELECTRICAL POWER II

7 EE08/7EP08/7EL08 SWITCHGEAR & PROTECTION - LAB
Any TEN experiments based on contents of 7EE04 SWITCHGEAR & PROTECTION

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SEMESTER: EIGHT

8EE 01/8EL01/8EP01 POWER SYSTEM STABILITY

SECTION-A

UNIT I: Basic Concepts
Meaning of stability, Steady state, Transient and Dynamic stability limits; Three Phase Synchronous Machine-circuit representation, voltage equation and Park's Transformation; Transient and Sub transient state analysis and Phasor diagrams, Voltage behind the transient and sub transient impedances, Parameters and Time Constants determination.

UNIT II: Steady State Stability - I
Steady state stability limit-short transmission line, Two machines system, Medium and Long transmission line, Clarke's diagrams for system with and without loss, Effect of inertia, Conservative criterion, Synchronizing coefficients and Multi machine system.
Unit III: Steady State Stability – II
Saturation effect, Saturated reactance, Equivalent reactance and its graphical determination; Short circuit ratio, Governor action and automatic voltage regulator effects.

SECTION-B

Unit IV: Transient State Stability – I
Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II
Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System
Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage ï time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXTBOOKS:

REFERENCE BOOKS:

8EE 02/8EL02/8EP02 HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I: Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsendâ€œ law, Streamer mechanism of spark pashanâ€œ law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V. Lines Design.
Basic terminology, Testing ñ Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXTBOOK:

REFERENCE BOOKS:
1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
3. E.Kuffer and M.Abdullaha ñHigh Voltage Engineering, Pergamon Press
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) – High Voltage Engineering, Khanna Publications, Delhi.

8EE 03/8EL03/8EP03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT I: Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity, unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT II: Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties, Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION - B


UNIT V: Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

8EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II

(1) ELECTRIC DRIVES & CONTROL

SECTION - A


UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, single phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION - B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, variable frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNTV: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifier exator flux oriented v.c., v.c. of current fed inverter drive & cycloconverter drive servorless control speed estimation controls EKF method

UNIT V: Direct torque & adaptave controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commisiong of drive. Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.
REFERENCES BOOKS:
1. Power Electronics: (Converts, Application & Design) - Mohan/Undeland/Rossing - John Wiley
2. Power Electronics: M.D. Singh, K.B. Khan Chardalli - TMH
3. Power Electronics: M.H. Rashid - Pearson Education
4. B.K. Bose: Modern Power Electronics and AC Drive, Pearson Education

EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II
(2) POWER QUALITY

SECTION - A

Unit I: Introduction
Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics
Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards

SECTION - B

Unit IV: Power Quality Solutions
Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding

Unit VI: Power Quality Measurement Tools & Power Quality Surveys
Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS:

REFERENCE BOOKS:

EE 04/8EL04/8EP04 (3) PROFESSIONAL ELECTIVE - II
(3) POWER SYSTEM MANAGEMENT

SECTION - A

UNIT-I: Principle and Practice of Management:
Basic Concepts- basic concepts of management-Role and importance of management in modern society, management as a profession
The Process of Management- The process of management; planning, organizing, directing, controlling, decision-making, leading etc.

Management Concepts- Managerial authority and responsibility-delegation and decentralization- Line and staff concepts-concepts in e-commerce etc.

UNIT-II: Marketing & Production/Operation Management:
Marketing Management- Introduction to Marketing, Marketing strategy, Consumer Behaviour, Marketing Research, Product/Services Decisions, Pricing Products/Services, Distribution management, Advertising & Sales promotion etc.
Production/Operation Management- Introduction to Production Planning and Process, Issues in Material and Inventory Management, Quality control and Management (quality circle, ISO 9000 series, just-in-time, TQM.), Maintenance Management, Purchasing Decision.

UNIT-III: Project, Financial & Human Resource Management:
Financial Management: Costing- Principles, types- operating, marginal, incremental, embedded etc, Budgeting & financial planning, Risk management etc.

SECTION-B

UNIT-IV: Dimensions of Power System Restructuring
Power system Restructuring:: Introduction to Power Sector Reforms/Restructuring/ Deregulation ï issues, prospects and lessons to developing countries
Environmental dimensions in power sector: Pollution & Depletion of natural resources, Waste Management, environmental legislation, green power, strategies for environmental management in power sector.
Rural Electrification: Issues relating to revised definition of village electrification, issues in electrifying remaining villages, decentralized generation and distribution for rural electrification etc.

UNIT-V: Management issues in Power Sector:
Financing of power sector: Financial problems of SEBs, strategies for financing capacity addition to generation, transmission and rural electrification, Risk management in power sector.
Human Resource development in power utilities: Change management, Training & Development, Culture of empowerment and accountability etc.

UNIT-VI: Marketing issues in Power Sector:

TEXT BOOKS:
2. Muhlemann, Production Operation Management, Macmillan publication
5. Philip Kotler, Marketing Management, PHI, New Delhi

REFERENCE BOOKS:
2. Fundamentals of Power System Economics, by Daniel S. Kirschen, Goran Strabac
4. Power System Economics, by Steven Stoft
6. Electricity Economics, by Geoffrey Rothwell, Tomas Gomez
11. India’s Power Sector Reforms Update, Paryas, Pune

8EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II
(4) GENERALISED MACHINE THEORY

SECTION-A

Unit I: Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage fluge, voltage and torque equations.

Unit II: Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.


SECTION-B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics. High torque cage motors- deep bar rotor and double cage rotor induction motors, steady state analysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and sharge motor and steady state analysis.

TEXT BOOKS:
2. SEELY: Electromechanical Energy Conversion

8EE 05/8EL05/8EP05 PROJECT & SEMINAR

8EE 06 DIGITAL SIGNAL PROCESSING LAB

Any TEN experiments based on contents of 8EP03 DIGITAL SIGNAL PROCESSING

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07AR01 ADVANCE CONSTRUCTION - I

Objective: The course will enable the learning in progression, starting from simple building elements, components, materials and construction techniques to develop strong sense of visualization.

Unit I: Analysis of different type of foundation as per load bearing capacity of soils, types of soil and building loading conditions. Caisson foundation its types and purposes. Combined foundation its purposes types.

Unit II: Earthquake resistant structure.
   a) Introduction of earthquake, types of earthquake, origin and causes of earthquake.
   b) Failure mechanism of structures due to earthquake. Analysis of earthquake affected load bearing masonry and framed structures

Unit III: a) Remedial measures in terms of planning, designing, materials and techniques for earthquake resistant structure.
   b) Retrofitting of earthquake affected buildings.

Unit IV: a) General study of standardisation of building elements its uses for various construction.
   b) Study of Modular co-ordination and its multipurpose functional application.

Unit V: Concept of curtain wall and structural glazing material and construction techniques, fixing details of various metal casements.

Unit VI: Architectural glass system.

Sessional work: Assignments, test, site visit and drawing on the above topics.

REFERENCE BOOKS:
2. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub, New, Delhi, 1989.

07AR02 ENVIRONMENTAL SERVICES – I

Objective: To impart knowledge of various aspects of city level water supply systems, drainage and solid waste disposal.

Unit I: Sources of water supply their types, water collection, water treatment, distribution of water from various sources.

Unit II: Rain water disposal and roof drain and rain water harvesting system.

Unit III: Water pollution and preventive measures.

Unit IV: Sewage treatment plant and its locational factor.

Unit V: Garbage disposal and recycling methods. Concept of recycling of solid and liquid waste in building. Vermicompostion, Biogas production.

Unit VI: Sewage disposal systems in unsewered location viz. septic tank, soak pit, acqua privy.

Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:
4. Bureau of Indian Standards.
6. Manas Handbook of Plumbing, Manas Publishers

07AR03 PROFESSIONAL PRACTICE

Objective: The objective of the course is to expose the students to the present trends of architectural practice and valuation.

Unit I: Role of professional bodies such as The Indian Institute of Architects, working, byelaws, categories of membership, election procedure and code of conduct; The Architects Act of 1972 and the Council of Architecture.
Unit II: Professional responsibilities of the architect, copyrights, scale of charges, variation of charges, mode of payment, termination of services, specialized building services.


Unit IV: Valuation for compensation on acquisition, compensation under central and state legislation, relevance of the Town Planning Act.

Unit V: Valuation for renewal or lease/extension of lease, standard rent, easement rights, dilapidation, insurance, estate development and advice on investment policy.

Unit VI: Arbitration, arbitrators, umpire and nature of arbitration.

Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:

07AR04: URBAN PLANNING

Objective: The objective of the course to develop the understanding of urban planning process through surveys, analysis, alternative planning strategies and urban planning issue.

Unit I: Need and study of Urban planning interrelationship between urban planning, urban design, urban landscape design and Architecture planning as a team work and role of urban planner in planning team. Hierarchical levels of planning.

Unit II: Planning during Medieval and renaissance period in western and Indian context.


Unit IV: Introduction to TPS, master plans, structure plan, regional plans, land use planning, Neighbourhood Planning, zoning.

Unit V: Recent trends in urban planning, New towns development, SEZ, JNNURM, Green cities, ISHDP, Urban renewal process.

Unit VI: National habitat and housing policy. Slum improvement scheme, ISHDP, DCR relevant to housing.

Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:
1. Gallion Arthur B & Eisna Simon, The Urban Pattern, City Planning and Housing.

07AR05 ARCHITECTURAL STRUCTURE-VI

Objective: Understanding of Basic Theory and principles of structural analysis and structural properties of elements.

Unit I: Design and detailing of simple G + 1 structure.

Unit II: Walls and chimneys subjected to kind pressure.

Unit III: Introduction to flat slabs, combined and eccentric footings selection criteria for above structures. (only Theory no Design)

Unit IV: Failure of structured
   a. Types of failure in various structure.
   b. Causes of failure.
   c. Evaluation of damage
d. Non destructive testing techniques.
   e. Techniques to prevent collapse failure of structures.
   f. Repaired and rehabilitation of structures.

Unit V: Simple welded and riveted connection (without moments) only axial loads.
Unit VI: Design of simple tension and compression member of trusses.

Sessional work:
Visit to construction sites to study R.C.C. Structures and steel fabrication work and preparing report.

REFERENCE BOOKS:

07AR06 ARCHITECTURAL DESIGN STUDIO - VII

Objective: To enable the student to design the large scale housing and housing project in an urban environment with emphasis on advanced building services and systems, urban development regulations, building byelaws.

BASIC CONTENTS:
1) Introduction to the designing of multifunctional community housing project on an appropriate scale.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning ,etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Planning and designing of large scale housing and building projects in an urban environment, advance building services, energy conservations, cost effective techniques and materials, building bye laws, housing schemes etc.
5) Architectural study tour relevant to design project.

Sessional work: One major design project and one time project with other task and assignments.

Viva Voce by external examiner at the end of Semester.

Suggested text books:

07AR07 ADVANCE CONSTRUCTION STUDIO - I

Sessional work:
Assignments and drawing on the above topics given in the subject 07AR01 Advance construction ï I.

Viva Voce by external examiner at the end of Semester.

07AR08 URBAN PLANNING STUDIO

Sessional work:
Assignments and drawing on the above topics given in the subject 07AR04 Urban Planning.

Viva Voce by external examiner at the end of Semester.

SEMMESTER: EIGHTH

08AR01 ARCHITECTURAL DESIGN - VIII

Objective: To expose students for designing of large scale urban design projects with emphasis on modern material, techniques, architectural styles advanced services, sustainable architecture, green architecture, climate responsive architecture etc.

Basic contents:
1) Introduction to urban design project planning and design consideration.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning ,etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Major design project may include high rise/tall buildings viz. apartment and commercial mixed used complexes, five star Hotel, multifunctional complex, community centers, super specialty hospital, institutions etc.
5) Architectural study tour relevant to design project.
Sessional work:

One major design project and one time project with other task and assignments.

SUGGESTED TEXT BOOKS:


08AR02 ADVANCE CONSTRUCTION - II

Objective: The course will enable the learning in progression, starting from simple building elements, components, materials and construction techniques to develop strong sense of visualization.

Unit I: General introduction to large span structures and high rise structures, planning features and its construction aspects. Chronological development of large span structural framework such as lamella, laminated portal frame, R.C.C. & steel portal frames.

Unit II: A) R.C.C. and steel space frame structures. B) Study of shell structures and its construction techniques from historical perspective. C) Shell structures such as Geodesic Schwedeler and Gitter Kuppel and its construction aspect.

Unit III: Constructions aspect consider in temporary structures which are in portable nature for various short terms events. Use of modular techniques and materials.

Unit IV: Ferrow cement techniques and its appropriate various uses for building construction elements.

Unit V: Introduction to prestressed concrete, principle and method of prestressing, advantages and disadvantages.

Unit VI: Types of elevators ĭ Electric, hydraulic, passenger, hospital, capsule, freight etc., details of lift shaft and other mechanism escalators and conveyors. Parallel and criss cross escalators, horizontal belt conveyors, horizontal moving walkway ĭ.

Sessional work:

Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:

2. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub, New, Delhi, 1989.

08AR03 ENVIRONMENTAL SERVICES – II

Objective: To expose the students specialized services in buildings.

Unit I: Natural and artificial ventilation system in buildings. Air conditioning methods equipments and ducting.

Unit II: Refuse disposal system in high-rise buildings, viz. ĭ refuse chute, purpose of service floor and other services.

Unit III: Lift, escalator, different type and use their lay out, lighting conductors, building automation system.

Unit IV: Energy construction, low energy systems, hybrid systems, integration and P. V. and wind system in the building, wind, solar and other non-conventional energy systems, solar thermal application for heating and cooling, electricity generation in building.

Unit V: Fire safety ĭ general provisions. Causes of fire in buildings, Fire protection standards ĭ safety regulation ĭ NBC ĭ planning consideration in building like non-combustible material, construction, stair cases and lift lobbies, fire escapes and A.C. system. Special features required for physically handicraft and elderly in building types.

Unit VI: Fire detectors and fighting installation. Type of detectors and usage. Alarm system, Fire fighting pumps, fire tank, dry and wet risers, automatic sprinkler, fire drill, refuge areas.

Sessional work:

Assignments, test, site visit and drawings on the above topics.
08AR04 SUSTAINABLE ARCHITECTURE

Objective: To sensitize students about the importance and need for Sustainable Planning concept and appropriate Architectural design concept as an emerging thrust area.


UNIT-II: Development in Historical Context - Early settlement pattern - Climate Responsive Planned Layouts - orientation of Streets and Buildings, Creation of Habitable Environment, Early Planning Methods.


UNIT-IV: Sustainable Architecture - Appropriate materials and construction - review of their properties workability, Eco Friendly construction practices - sustainable campuses and case studies.

UNIT-V: Sustainable Planning and Policies - Awareness programme at National, International levels Rio de Jenero agenda - Earth summits - agenda involved - their realization.

Sessional work: Assignments and test on the above topics.

REFERENCE BOOKS:
1. O. H. Keonigsberger; T. G. Ingersoll and others; Manual of tropical housing and building - Part-I; Longmans, London-1980
2. M. Evans; Housing, climate and comfort; Architectural press London-1980
3. B. G. Givoni; Man, climate, and architecture; Applied science, banking, Essex, 1982
4. N. K. Bansal and others; Passive building design; Elsevier science-1994.

08AR05 LANDSCAPE DESIGN

Objective: To enable students realize that architectural design could enhance and enrich built environment through a study and understanding of plants and vegetation historical achievements and techniques of application in the overall context of ecology.


UNIT-II: History of the art of garden design of India, China, Persia, Japan, Italy, France and England.

UNIT-III: Garden Design of the modern world.

UNIT-IV: Basic Principles of landscape design and element. Types of landscape elements and its various uses.

UNIT-V: Plant classification and nomenclature, plant identification. Characteristics of various types of plants and their suitability of landscaping, plant selection criteria, planting design and visual aspects of plant form.

UNIT-VI: Methodology and process of site analysis, data collection, compilation, Presentation and analysis techniques. Preparation, interpretation and evolution of landscape plans site planning.

Sessional work:
Assignments, tests, and tutorials on the above topics.

REFERENCE BOOKS:
08AR06 PROFESSIONAL ELECTIVE – I (1) HOUSING

Objective: To sensitize students about the need for, demand and supply of housing in India, to expose the role or function of various housing agencies, the typologies of housing with basic environmental issues.

UNIT-I: Housing Issues – Indian Context. Housing as Architecture – basic need – demand and supply of housing – Housing Agencies and their role in housing development.

UNIT-II: Social factors influencing housing design, affordability, economic factors and influence of traditional housing and planning features.

UNIT-III: Housing surveys and standards. Sources of data and information, methods and techniques of housing survey, housing standards etc.


UNIT-V: Case studies of housing schemes designed by eminent architects. High Rise Housing.

UNIT-VI: National habitat and housing policy slum improvement scheme, ISHDP, DCR relevant to housing.

Sessional work:
Assignment and case studies of above topics.

TEXT BOOKS:
2. Karnataka state Housing Board – MANE – Publication - 1980

08AR06 PROFESSIONAL ELECTIVE – I (2) ENVIRONMENTAL PLANNING

Objective: To provide advanced knowledge on how all issues and concerns of environment can integrate to architectural design process.

UNIT-I: Introduction to the ideas, issues and concepts of sustainable Architecture, Global Environment, Principles of environmentally and ecologically supportive Architecture.


Sessional work:
Assignment and case studies of above topics.

TEXT BOOK:

08AR06 PROFESSIONAL ELECTIVE – I (3) CONSTRUCTION MANAGEMENT

Objective: To establish and develop construction management skills – network techniques, construction equipments and methods along with quality control in construction.

UNIT-I: Introduction to project management concepts – background of management, purpose, goal and objectives. Traditional management system, Gantt approaches, load chart, progress chart, bar charts, merits and limitation schedule time estimates units.
UNIT II: Project management, resources balancing, phasing of activities, programmes, scheduling project control, reviewing, updating and monitoring.

UNIT III: Introduction to modern management concepts. Introduction to PERT and CPM network concepts, inter relationship, information, data sheets and development of network. CPM for management, CPM network analysis, identification of critical path floats, computation result sheets.

UNIT IV: PERT Network, introduction to the theory of probability and statistics, probabilistic aim estimates for the activities of PERT Network.

UNIT V: Financial management. Introduction to two dimensional network analysis activity cost information. Cost time relationship, crashed estimates for the activities, project direct cost and indirect cost.

UNIT VI: Construction quality control and inspection, significance of variability and estimation of risks, construction cost control, crashing of networks.

Sessional work:
Assignment and case studies of above topics.

TEXT BOOKS:
2. S. P. Mukhopadyay, Project Management for Architects and Civil Engineers, IIt, Kharagpur.
3. Ahuja H. N. “Construction Performance Control by Networks” Wiley Inter science Publication.

08AR07 ARCHITECTURAL DESIGN STUDIO - VIII
Sessional work:
Assignments and drawing on the above topics given in the subject 08AR01 Architectural Design Studio I VIII.
Viva Voce by external examiner at the end of Semester.

08AR08 ADVANCE CONSTRUCTION STUDIO - II
Sessional work:
Assignments and drawing on the above topics given in the subject 08AR08 Advance construction Studio I II.
Viva Voce by external examiner at the end of Semester.

08AR09 LANDSCAPE DESIGN STUDIO - II
Sessional work:
Assignments and Sketches, Case Studies of contemporary period, Landscape Proposals for Residential, Public, Institutional Buildings on the above topics given in the subject 08AR09 Landscape Design Studio I II.
Viva Voce by external examiner at the end of Semester.

SEMESTER: NINTH

09AR01 PRACTICAL TRAINING
Each candidate shall have to prepare a detail report along with necessary drawing, sketches, measurement, record, reading, observations, survey analysis, log sheets and modes, if necessary on the following six aspects which are concerned with the practical training. This report shall be submitted for the Viva-Voce examination duly certified by the Principal of the College.

1. Critical appraisal - of any building that he/she or his/her employer has designed and executed. The building shall be used and the students may record the reactions of the users to support his/her appraisal in addition to photographs, drawing etc.
   Marks (Sessional) - 25

2. Site Supervision and Practice - A detail report of any major part of a small building that has been personally supervised by the candidate. It may include checking site measurement preparation of a bill, site instructions and checking of the executed work.
   Marks (Sessional) - 25

3. Field Observation - A report on architectural use of the site conditions. For example, Electric poles, Water tanks, slope of the site etc.
   Marks (Sessional) - 25

4. Log sheet and office certificate - A student shall fill the log sheets as a record of his every day work aid shall submit the same along with the certificate from his/her employer.
   Marks (Sessional) - 25

5. Working drawing and complete estimate of small project - A student shall submit all the working details prepared by him/her during his/her practical training along with estimate of small project.
   Marks (Sessional) - 100

6. Viva-Voce Each candidate shall be individually interviewed and questioned on any of the sublet mentioned above by a Principal,
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Head of Department of Architecture and Two external examiners appointed by the University.

Marks (Viva-Voce)-100
Total Marks - 300
Pass Marks - 150

SEMESTER: TENTH

10AR01 PROFESSIONAL ELECTIVE – II
(1) INDUSTRIAL ARCHITECTURE

Objective: To impart knowledge of planning and design features, materials and techniques useful in industrial structures.


UNIT-II: Automation techniques & its impact, circulation and area requirement, influence on design Internal & External Environment Control Precaution at site.

UNIT-III: Pioneers and Architects role in industrial design. Study of examples of pioneer to include Peter Behrens, Max Berg, Hans Poelzig and P. L. Nervi. Impact of expressionism and international style.

UNIT-IV: Responsibilities of architect in innovative corporate image, understanding industrial environments through Indian case studies.


Sessional work: Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture.

10AR01 PROFESSIONAL ELECTIVE – II
(2) CLIMATE RESPONSIVE ARCHITECTURE

Objective: To sensitize students about the importance and need for Climate Responsive Architecture Design concept.


UNIT-III: Low Energy design Hybrid Systems, Integration of PV and wind systems in the buildings.

UNIT-IV: Day Light principles, Glare amount of daylight, daylight factor, orientations and sizes of opening to achieve diffused lights.

UNIT-V: Application of Climatic Principles Evolution of Plan Form to minimize Heat Gain in Tropical Climates, Orientation of Building with respect to sun, wind, sizes of fenestration & its orientation, Use of evaporative cooling, ground coiling, cavity walls, topography, water bodies, vegetation. Landscape elements, cross ventilation system to achieve natural comfort level in indoor & outdoor spaces.

UNIT-VI: Planning and Design features to be considered with respect to various Climate.

Sessional work: Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture.

10AR01 PROFESSIONAL ELECTIVE – II
(3) VERNACULAR ARCHITECTURE

Objective: To impart knowledge about various manmade and natural forces behind the evolution of traditional architecture.


UNIT-IV: Western influences on Vernacular Architecture Colonial influence on the traditional House, Bangla & Bungalow, House typologies, settlement planning, Pondicherry & Cochin.
UNT- V: Secular Architecture — Medieval Period — Citadels, Palaces, Towers, Gateways, Public Buildings etc. in the medieval towns of Jodhpur, Jaipur, Jaisalmer, Gwalior etc.

Sessional work:
Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture.

10AR02 ARCHITECTURAL PROJECT / THESIS

Objective: Develop any chosen architectural design project, emphasis being on integration of all technical, human & aesthetic aspect in the Architectural design solution.

The topic would be selected by students, subject to approval by the department. The topic selected may be a live design project or research oriented but essentially concluding in its application in architectural design project. The work progress evaluation would also be based on intermediate reviews of the study in presence of panel of teachers and experts from professional field.

The Viva-voce would be in the form of final Review on the basis of sessional submission in presence of two External Examiners. The H.O.D. Department of Architecture and student's teacher Guide would act as Internal Examiners.

The students would be required to explain and defend their study and design. The submission would consist of proper Presentation of Drawings, Thesis Report and Model.

The candidate shall carry out thesis considering the following aspect — Research analysis and data collection, site selection & justification, user requirements & justification, climatic conditions, socio-economic problems, communication, Transportation, Landscape & Urban Planning.

10AR03 SEMINAR

Objective: Seminar is intended to evaluated the student's ability to explore in the field of architecture and make in depth investigation in the chosen area.

The students are expected to choose topics which are of special interest to them and prepare a Report and Drawings to show analysis of investigation. The Review of work would be done in presence of H.O.D. Department of Architecture, and nominated teacher guide, and other teachers.

The Viva-voce would be in the form of proper presentation of the Drawings, Information/Data and Report. The Viva-voce would be in presence of External Examiner. The H.O.D. Department of Architecture, and student's teacher Guide would act as internal examiners.

The Seminar topic can be related to any of the following subject — Architectural theory, history, design determinates, design language, design evaluation, building types, urban planning and design, housing, interior design, landscape design, building technology and environmental sciences, professional practice and any other related field, accepted and approved by the Department.

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
INFORMATION TECHNOLOGY
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: SEVENTH

7IT 01 DIGITAL SIGNAL PROCESSING


Unit III: z-Transform and Analysis of LTI Systems: Definition of z-Transform, properties, rational z-Transforms, evaluation of the inverse z-Transforms, analysis of linear time invariant systems in z-domain, transient and steadystate responses, causality, stability, pole-zero cancellation, the Schur-Cohn stability test

Unit IV: Fourier Transforms, the DFT and FFT: Definition & properties of Fourier transform, relation with ztransform. Finite duration sequences and the discrete Fourier transform(DFT), properties, circular convolution. Fast algorithms for the computation of DFT: radix-2 and radix-4 FFT algorithms


Unit VI: Realization of Discrete-Time systems: Structures for realization of Discrete-Time systems, realization of FIR systems: Direct Form, Cascade Form, Frequency sampling and Lattice structures. Realization of IIR filters: Direct Form, Signal flow graph and Transposed structures, Cascade form, Lattice and Lattice-ladder. Realization for IIR systems.

TEXT BOOK:

REFERENCE BOOKS:

7IT02 OBJECT ORIENTED ANALYSIS AND DESIGN


UNIT-II: Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

UNIT-III: Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Instances, Object Diagram


UNIT-V: Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.


TEXT BOOK:

REFERENCE BOOKS:
1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

7 IT 03 WEB TECHNOLOGY


Unit – II: Style Sheets: Introduction to Cascading Style Sheets, CSS Features, CSS Core Syntax, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Beyond the Normal Flow


Unit – IV: Server-Side Programming: Java Servlets Servlet Architecture Overview, Servlet Generating Dynamic Content, Servlet Life Cycle, Parameter Data, Sessions, Cookies, URI Rewriting, Other Servlet Capabilities, Data Storage, Servlet and Concurrency.


TEXT BOOK:
1. Web technologies by Jeffrey C. Jackson (Pearson)

REFERENCE BOOKS:
1. The Web Warrior guide to Web Programming by Xue Bai, Micheal Ekedahl, Don Gosselin (CENGAGE Learning)
2. Internet Protocols by Subrata Goswami (Springer India)
3. Dietel and Dietel: WWW: How to Program, (LPE)
4. Dustin R Callaway: Inside Servlets (LPE)

7 IT 04 REAL TIME & EMBEDDED SYSTEMS

UNIT I: Introduction to embedded systems, Processor in the system, Hardware units required in the exemplary cases, Software embedded into a system. Final Machine implementable software for a product. Software in Processor specific assembly language and high level language, Device drivers device management using an operating system, Software design for scheduling multiple tasks and devices using RTOS, Embedded SoC and in VLSI circuits.

UNIT II: Structural units of the processor, Allocation of memory to program segment and blocks, memory map of the system, Memory blocks for different data sets and structures, serial communication using I2C, CAN and advanced I/O buses between the networked multiple devices, Device drivers, Virtual Devices, Device drivers for parallel port, serial and timing devices, Context and periods for context switching, deadline and interrupt latency.

UNIT III: Software programming in assembly language and C, Use of data structures, Queues, Stacks, Lists and Trees, Function pointers, Function queues and ISR queues, Queues for implementing protocol for a network, Queuing of functions on interrupts, Use of FIFO queues, Stacks, Lists and Ordered Lists, Embedded programming.

UNIT IV: Modeling process, Use of dataflow & control data flow graphs, Programming model for event controlled or response time constraint, Real time programs, Inter process Communication and Synchronization, Multiple processes in an application, Sharing data by multiple tasks, use of finite states machine model & Petri net Model, Process, Tasks, Threads.

UNIT V: Use of Semaphores for a task or for Critical section of code, Mutex & P & V, Priority inversion problems & deadlock situations IPC issues, Use of Semaphore flags or Mutex as resource key, use of message queues, mailboxes, pipes, virtual sockets, RPCs.
UNIT VI: Introduction to RTOS, OS Services, RTOS Services, Schedule management for multiple tasks in Real Time, Handling of interrupt source call, RTOS task scheduling models, Cooperative Round Robin Scheduling using a Circular Queue of ready tasks and using and Ordered list as per precedence constraints, Cycling scheduling in Time Sharing, Preemptive scheduling, Critical section service by preemptive scheduler, fixed Real Time scheduling, Precedence assignment in Scheduling algorithms, Performance metrics, IEEE Standard POSIX 1003.1B, fifteen-point strategy for Synchronization, Embedded Linux Kernel.

PRACTICALS: Minimum 12 experiments based on above syllabus.


PROFESSIONAL ELECTIVE - I 7IT05 (1) DISTRIBUTED DATABASE MANAGEMENT SYSTEM


UNIT IV: Distributed Transaction management and Concurrency control: Definition, Properties and types of Transaction. Distributed Concurrency control: Serilizability, Taxonomy, Locking based concurrency control algorithms, Deadlock management.

UNIT V: Distributed DBMS reliability: Reliability concepts and measures, Failures and Fault tolerance in distributed systems, Failures in DDBMS, Local reliability protocols, dealing with site failures.
Design and Evaluation of Simulation Experiments: Length of simulation runs, variance reduction techniques, Experimental layout, validation, summary and conclusions.

UNIT VI: Simulation Languages and Introduction to GPSS
Different special purpose languages used for continuous and discrete systems and comparison-factors affecting the selection of discrete system simulation language-comparison of GPSS and SIMSCRIPT. A detailed study of GPSS with examples.

TEXT BOOKS:

REFERENCE BOOKS:

PROFESSIONAL ELECTIVE - I
7IT05 (3) ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Unit-I: Introduction to Artificial Intelligence: The AI Problems, The Underlying Assumption, What is an AI Technique; Problems, Problem Spaces, and Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs

Unit-II: Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-first Search, A* Algorithm, Problem Reduction, AND-OR Graphs, The AO* Algorithm, Constraint Satisfaction, Means-ends Analysis


Unit-IV: Symbolic Reasoning Under Uncertainty Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver,


Unit-V: Understanding What is Understanding?, Understanding as Constraint Satisfaction, Natural Language Processing, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking, Common Sense Qualitative Physics, Common Sense Ontologies.


TEXT BOOK:
Artificial Intelligence ñ Elaine Rich, Kevin Knight, Nair (Third Edition) [Mc Graw Hill]

REFERENCE BOOKS:
1. Introduction to Artificial Intelligence and expert system ñ Dan W. Patterson
2. Expert System- Peter Jackson (Third Edition)
3. Introduction to Artificial Intelligence ñ Rajendra Akerkar

PROFESSIONAL ELECTIVE - I
7IT05 (4) MULTIMEDIA TECHNOLOGIES


UNIT V: Basic Video Compression Techniques: Introduction, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261, Intra-Frame (I-Frame) Coding, Inter-Frame (P-Frame) Predictive Coding, Quantization in H.261, H.261 Encoder and Decoder, H.261 Video Bitstream Syntax, MPEG-1, Motion Compensation in MPEG-1, Major Differences from H.261


TEXT BOOK: Ze-Nian, Li, Mark S. Drew "Fundamentals of Multimedia" (Pearson Education)


7IT06 DIGITAL SIGNAL PROCESSING - LAB: Minimum 8 experiments based on the syllabus of 7IT01.
using and Ordered list as per precedence constraints, Cycling
scheduling in Time Sharing, Preemptive scheduling, Critical
section service by preemptive scheduler, fixed Real Time
scheduling, Precedence assignment in Scheduling algorithms.
Performance metrics, IEEE Standard POSIX 1003.1B, fifteen-point
strategy for Synchronization, Embedded Linux Kernel.

PRACTICALS : Minimum 12 experiments based on above syllabus.

TEXT BOOK:
1. Rajkamal Embedded Systems, Architecture, Programming & Design,
   TMH.

REFERENCE BOOKS:
1. Real Time Systems, Jane W. S. Liu, Pearson Education
2. Embedded System Design, A Unified Hardware/Software Introduction,
   Frank Vahid, Tony Givargis, John Wiley & Sons P Ltd

7IT09

PROJECT AND SEMINAR:
Seminar should be preferably based on the proposed project to
be covered in final year. The semester should be conducted in seventh
semester and evaluated. Each candidate shall submit a seminar report,
deliver the seminar and face the viva-voce. The distribution of internal 50
marks shall be as follows.
1. Seminar report preparation and submission :- 10 marks
2. Seminar delivery/ presentation:- 20 marks
3. Seminar viva-voce:- 10 marks
4. Attendance in all seminar session:- 10 marks

SEMESTER: EIGHT

8IT01

DIGITAL AND WIRELESS COMMUNICATION

UNIT I: Information Theory: Elements of digital communication system,
   Entropy, Rate of information, Joint entropy, Conditional entropy,
   Mutual information, Channel Capacity, Shannon's Theorem, Shanonan
   Hartely Theorem, coding efficiency, Shananon-Fano coding Theorem.

UNIT II: Error controlling and coding: Methods of controlling error, linear
   block codes, matrix description of linear block codes, error
detection and error correction capabilities of linear block codes,
single error correcting Hamming codes, Cyclic codes, syndromes
calculation, error detection, Introduction to Convolution codes

UNIT III: Spread Spectrum Signals: Model of spread spectrum
   communication system, direct sequence spread spectrum signals,
generation of PN sequences, frequency hopping spread spectrum
   (slow frequency and high frequency hopping), comparison, basic
   principles of TDMA, FDMA, CDMA.

UNIT IV: Cellular Telephone Concepts: Introduction, mobile telephone
   service, cellular telephone architecture, frequency reuse, cell
   splitting, sectoring, segmentation and dualization, cellular system
   topology, roaming and handoffs.

UNIT V: GSM & CDMA Technologies : Introduction to GSM, GSM
   Network Architecture, Protocol Architecture, GSM Channels,
   Frame structure for GSM, Authentication & Security in GSM,
   Introduction to CDMA, Architecture of CDMA System, IS-95
   CDMA Forward & Reverse channel, Soft handoff.

UNIT VI: Wireless network technology: IEEE 802.11WLAN technology,
   ETSI HIPERLAN Technology, IEEE 802.15 WPAN Technology,
   IEEE 802.16 WMAN Technology, Mobile Ad hoc Network
   (MANETs), Mobile IP and Mobility Management, Mobile TCP,
   Wireless Sensor Networks, RFID Technology, Security
   Requirements for Wireless Network

TEXT BOOKS:-

REFERENCE BOOKS:-
2. William Stallings: Wireless Communication and Networks, Pearson
   Education Asia.
5. Wayne Tomasi : Advanced Electronics Communication Systems,
   Pearson.
6. Theodore S. Rappaport, Wireless Communications- Principles and
   Practice, Pearson.

8IT02

NETWORK ADMINISTRATION AND SECURITY

UNIT I: Introduction to network security, passive and active attacks,
   authentication, integrity, access control. The model of
   internetwork security, internet standards: the internet society
   and RFC publications (Request for comments.)

UNIT II: Cryptography: Encryption principles and various algorithms,
   standardization process, key distribution, public key
   cryptography and message authentication, digital signature.

UNIT III: Network security applications: Kerberos, X.509 directory
   authentication services, e-mail security PGP (Pretty Good Privacy)
   operational description. MIME (Multipurpose Internet Mail
   Extensions), S MIME (Security/Multipurpose internet mail
   extensions) functionality.

UNIT V: Network Management Security: Basic concepts of SNMP, Network management architecture and protocol architectures, proxies, services, SNMPv1 authentication service, access policy and proxy service, SNMPv2 architecture, message processing and user security model, view based access control.

UNIT VI: System Security: Intruders, Intrusion technologies, password protection, password selection strategies, Intrusion detection, viruses and related threats: Nature of viruses, types, micro viruses and various antivirus approaches. Firewall: Characteristics, types of fire walls, Firewall configuration, Trusted systems, data access control, the concept of the trusted systems.

TEXT BOOKS:
REFERENCE BOOKS:
1. Security for Telecommunication and Network management by Moshe Rozenbit (PHI)

8IT03 SOFTWARE ENGINEERING


TEXT BOOK:
Pressman Roger. S. : Software Engineering, A Practitioner’s Approach TMH.

REFERENCE BOOKS:
1. Somerville : Software Engineering (Addison-Wesley) (5/e)

8IT04 PROFESSIONAL ELECTIVE-II
(1) DATA WAREHOUSING AND DATA MINING
UNIT I: Introduction, Data mining, Data mining functions, classification and major issues. Data Preprocessing : Data cleaning, data integration and transformation, data reduction, discretisation & concept hierarchy generation. (10 hours)

UNIT II: Data mining primitives : Data mining primitives, data mining query language. Concept description : concept description, data generalization, Analytical characterization, mining class comparison. (8)

UNIT III: Application and trends in data mining : data mining applications, data mining systems and research prototypes, additional themes on data mining, trends in data mining (8)

UNIT IV: Data ware house and OLAP Technology for data mining : What is data ware house, multidimensional data model, data ware house architecture, data ware house implementation. (8)

UNIT V: Data Staging : overview, plan effectively, dimension table staging, fact table loads and ware house operations, data quality and cleansing, miscellaneous issues. (8)
UNIT VI: Building end user applications: role of end user application, application specification, end user application development, maintaining and growing data warehouse: manage the existing data warehouse environment, prepare for growth and evaluation.

TEXT BOOKS:

REFERENCE BOOKS:
1. Berson: Data Warehouse, Data Mining and OLAP, Tata McGraw Hill.
2. Arun K. Pujari: Data Mining Techniques, University Press (Orient Longman)

8IT04 PROFESSIONAL ELECTIVE - II
(2) WEB COMMERCE


UNIT II: Approach to safe E-commerce: overview, secure transport protocol and transaction, SEPP, SET, certificate for authentication, security on web server and enterprise network.

UNIT III: Electronic cash and Electronic payment scheme: Internet monetary payment and security requirements; Payment & purchase order process, Online Electronic cash.


UNIT V: Secure E-mail Technologies: Introduction, means of distribution, models for message handling, How does Email work? MIME, S/MIME, mass comparisons of security methods, MIME and Related facilities for EDI over the Internet


TEXT BOOK:
Daniel Minoli & Emma Minoli: Web Commerce Technology Hand Book

REFERENCE BOOKS:
1. David Whiteley: E Commerce (TMH)
2. Kalakota Whinston: frontiers of e Commerce (Pearson education)


TEXT BOOK:
1. Tim Mather, Subra Kumarswamy, and Shahed Latif, Cloud Security and Privacy, O'Reilly.

REFERENCES:
1. George Reese, Cloud Application Architectures, O'Reilly.

8IT04 PROFESSIONAL ELECTIVE - II
(4) NEURAL NETWORK AND FUZZY LOGIC

UNIT-I: Fundamental of Neural Network: Basic concepts of Neural Network, Human Brain, Model of artificial neurons, Neural Network architecture, Characteristics of Neural Network, Learning methods, Taxonomy of Neural Network architecture, Early Neural Network architecture. (08 Hrs)


UNITIII: Associative Memory:- Autocorrelation, Hetro-correlation, Multiple training encoding strategy, Exponential BAM, Associate memory for Real coded pattern pairs, Character recognition application. (08 Hrs)

UNITIV: Adaptive Resonance Theory:- Cluster structure, Vector quantization, classical ART network, simplifier ART architecture, ART1: architecture, special features and algorithm, ART2: architecture, special features and algorithm, character recognition using ART1. (08 Hrs)


UNITVI: Fuzzy Systems: Crisp logic, Laws of Propositional logic, Inference in Propositional logic, Predicate logic, Interpretations of Predicate Logic Formula, Inference in Predicate Logic, Fuzzy logic, Fuzzy Quantifiers and Inference, Fuzzy rule based system, Defuzzification methods, applications. (08 Hrs)

TEXT BOOK:
S. Rajesekaran, G. A. Vijayalakshmi Pai: Neural Network, Fuzzy logic, and Genetic algorithms Synthesis and Applications PHI.

REFERENCE BOOKS:
1. S. Hykin: Neural Networks Pearson Education.
3. Zurada: Artificial Neural Networks.

8IT05 NETWORK ADMINISTRATION AND SECURITY - LAB:
Minimum 8 experiments based on the syllabus of 8IT02.

8IT06 SOFTWARE ENGINEERING-LAB:
Minimum 8 experiments based on the syllabus of 8IT03.

8IT07 COMPUTER LAB-V (CONTENT MANAGEMENT SYSTEM):
Practicals based on Content Management Systems:
A list of sample practicals can be as under:
1. To Study Content Management System.
2. To Study Different Types of Content Management System.
3. Installation of Content Management System framework.
4. Installation of Different Tool on Content Management System framework.
5. To Study WAMP Server and there installation.
6. To creating & Configuring Menus in Joomla
7. To installing & Configuring Templates in Joomla.
8. To design advance templates & CSS Tricks
9. To Customise XML Templates in Joomla

8IT08 PROJECT AND SEMINAR:
The project shall be evaluated in three phases based on the progress of the project work.
Phase I: - Problem, Definition and Design
Phase II: - Problem Implementation and Testing
Phase III: - Project demonstration & report submission.
Each phase shall be internally evaluated for 25 marks.

The external evaluation of the project shall be based on demonstration of the project and viva-voce

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
BIOMEDICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: SEVENTH

7 BM01 BIO SIGNAL PROCESSING

UNIT I: Discrete-time Signals and Systems:
Characterization, classification and time-domain representation of discrete-time signals, Typical sequences and their representation, Classification of sequences, Basic operations on sequences, Discrete-time systems.

UNIT II: The discrete-time Fourier transform (DTFT):
The discrete Fourier Transform (DFT), Computation of the DFT. Theory of Z-Transform Mathematical derivation of the unilateral z-transform, Properties of the z-transform, the inverse z-transform, The bilateral z-transform, Power series, Region of convergence (ROC) and its impedance.

UNIT III: Neurological Signal Processing:

UNIT IV: Cardiological Signal Processing:
Basic electrocardiography, ECG data acquisition, ECG lead system, ECG parameters and their estimation, the use of multiscale analysis for parameters estimation of ECG waveforms, Arrhythmia analysis monitoring, Long-term continuous ECG is recording.

UNIT V: ECG Data Reduction Techniques:
Direct data compression techniques, Direct ECG data compression techniques, Transformation compression technique, other data compression techniques, The PRD index.

UNITVI: Data compression techniques:
ECG acquisition and transmission. Data reduction algorithms. Turning point. AZTEC, CORTES and the KL transform.

TEXT BOOKS:


REFERENCE BOOKS:

7 BM02 ARTIFICIAL ORGANS & REHABILITATION ENGINEERING

UNIT I: Introduction to artificial organs:
Biomaterials used in artificial organs and prostheses, inflammation, rejection, correction. Rheological properties of blood, blood viscosity variation: effect of shear rate, hematocrit, and temperature and protein contents. Casson equation, flow properties of blood through the blood vessels, problems associated with extracorporeal blood low:Substitutive medicine, outlook for organ replacement, design consideration, evaluation process.

UNIT II: Audiometry:

Rehabilitation Engineering:

UNIT III: ARTIFICIAL HEART AND CIRCULATORY ASSIST DEVICES:
Engineering design, Engg design of artificial heart and circulatory assist devices, blood interfacing implants – introduction, total artificial hearts & ventricular assist devices, vascular prostheses, Non-blood interfacing implants for soft tissues- sutures and allied augmentation devices, percutaneous and skin implants, maxillofacial implants, eye and ear implants.

UNIT IV: CARDIAC VALVE PROSTHESES:
Mechanical valves, tissue valves, current types of prostheses, tissue versus mechanical, engineering concerns and hemodynamic assessment of prosthetic heart valves, implications for thrombus deposition, durability, current trends in valve design, vascular grafts-history, synthetic grafts, regional patency, thrombosis, neointimal hyperplasia, graft infections.

UNIT V: ARTIFICIAL KIDNEY:
Functions of the kidneys, kidney disease, renal failure, renal transplantation, artificial kidney, dialyzers,
membranes for haemodialysis, haemodialysis machine, peritoneal dialysis equipment-therapy format, fluid and solute removal.

**ARTIFICIAL BLOOD:** Artificial oxygen carriers, fluoro carbons, hemoglobin for oxygen carrying plasma expanders, hemoglobin based artificial blood.

**UNIT VI: ARTIFICIAL LUNGS:** Liver gas exchange systems, Cardiopulmonary bypass (heart-lung machine)-principle block diagram and working, artificial lung versus natural lung. Liver functions, hepatic failure, liver support systems, general replacement of functions.

**ARTIFICIAL PANCREAS:** Structure and functions of pancreas, endocrine pancreas and insulin secretion, diabetes, insulin, insulin therapy, insulin administration systems. Tracheal replacement devices, laryngeal replacement devices, Artificial esophagus Artificial Skin: Vital functions of skin, current treatment of massive skin loss, design principles for permanent skin replacement.

**TEXT BOOKS:**
1. Biomedical Engineering Handbook-Volume 1, 2nd Edition ï by J.D.Bronzino, CRC

**REFERECNE BOOKS:**

7BM03 MEDICAL EXPERT SYSTEMS

**UNIT I:** General issues and overview of AI, AI Techniques, AL problems, AI Techniques, importance and areas of AI, problem solving state space search-DLF, BFS Production system, problem characteristics.

Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem reduction, Constraint satisfaction-Cryptarithmetic and problems.

**UNIT II:** Knowledge representation & mapping, approaches to knowledge representation, issues in knowledge representation, Representing simple facts in logic, representing instance and relationships, Resolution and natural deduction Representing knowledge using rules, Procedural v/s Declarative knowledge.

**UNIT III: AI programming language:** Prolog- objects, relationships, facts, rules and variables, Prolog: Syntax and data structures, representing objects & relationships by using ftree $o$and flists $q$, use of cut, I/O of characters and structures.

**UNIT IV:** Symbolic reasoning under uncertainty: Introduction to monotonic reasoning, Logics for Non monotonic reasoning, implementation issues, implementation: DFS & BFS. Architecture of the expert system ï problem selection ï formalization -implementation ï evaluation.

**UNIT V:** Slot and filler structures: Semantic nets, frames, conceptual dependency, scripts, CYC Natural languages and NLP, Syntactic parsing techniques, semantic analysis case grammar, augmented transition net, discourse & pragmatic processing, translation.

**UNIT VI:** Definition and characteristics of Expert System, representing and using domain knowledge, Expert system shells Knowledge Engineering, knowledge acquisition, expert system life cycle & expert system tools, MYCIN & DENDRAL examples of expert system.

**TEXT BOOKS:**
1. Introduction to AI & Expert System ï D. W. Patterson, Prentice hall of India

**REFERECNE BOOKS:**
3. Introduction to Artificial Intelligence ï Charnaik & McDermott, Addison Wesley

7BM04 HOSPITAL ENGINEERING & MANAGEMENT

**UNIT I:** Classification of hospital & architecture: General hospital, specialized hospital, primary health care ï their role and functions, Aspects of hospital services ï inpatient, outpatient and emergency. Location and environment of hospital.

**UNIT II:** Hierarchy of medical and paramedical staff & their functions and responsibilities:- Modern Hospital Architecture- space in a...
hospital building, design of ward, intensive care units, air conditioning, plumbing & sanitation, gas supply, waste disposal, cleaning, dietary, sterilizing, laundry, storage and operation theatre systems, Radiology, Central labs, Blood banks, OPD, Causality, etc.

UNIT III: Electrical power systems in hospitals:

UNIT IV: Air conditioning & gas supply systems:

UNIT V: Hospital engineering & Management:

UNIT VI: Hospital Information system:
Role of database in HIS. Need of Networking in HIS. Overview of Networking, topologies and its configuration. Structuring medical records to carry out functions like admissions, discharges, treatment history etc. Computerization in pharmacy & billing. Automated clinical laboratory systems & radiology information system.

REFERENCE BOOKS:
1. Harold E. Smalley, "Hospital Management Engineering" A guide to the improvement of hospital management system, PHI.
2. C.A. Caceras, "Clinical Engineering"
3. L.C. Redstone, "Hospital and Health Care Facilities" Ward, Anesthetic Equipments IS, "ISO Certification details"
4. Bhaumick and Bhattachary, "EHV Substation equipments"
5. Alexander Kusko, "Emergency and Standby Power Systems"
6. Balagune Swamy, "Reliability Engineering"
7. Anantha Narayanan, "Basic Refrigeration and Air Conditioning"

PROFESSIONAL ELECTIVE-I

7 BM 05 (1) TISSUE ENGINEERING

UNIT I: Introduction:
Basic definition, Structural and organization of tissues: Epithelial, connective; vascularity and angiogenesis, basic wound healing, cell migration, current scope of development and use in therapeutic and in-vitro testing.

UNIT II: Cell culture:
Different cell types, progenitor cells and cell differentiations, different kind of matrix, cell-cell interaction. Aspect of cell culture: cell expansion, cell transfer, cell storage and cell characterization, Bioreactors.

UNIT III: Molecular biology aspects:
Cell signaling molecules, growth factors, hormone and growth factor signaling, growth factor delivery in tissue engineering, cell attachment: differential cell adhesion, receptor-ligand binding, and Cell surface markers.

UNIT IV: Scaffold and transplant:
Engineering biomaterials for tissue engineering, Degradable materials (collagen, silk and polyactic acid), porosity, mechanical strength, 3-D architecture and cell incorporation.

UNIT V: Engineering tissues for replacing bone, cartilage, tendons, ligaments, skin and liver. Basic transplant immunology stems cells: introduction, hepatopoiesis.

UNIT VI: Case study and regulatory issues:
Case study of multiple approaches: cell transplantation for liver, musculoskeletal, cardiovascular, neural, visceral tissue engineering. Ethical, FDA and regulatory issues of tissue engineering.

TEXT/REFERENCE BOOKS:
1. Principles of tissue engineering, Robert, P.Lanza, Robert Langer & William L.
2. The Biomedical Engineering Handbook, Joseph D. Bronzino
3. Introduction to Biomedical Engg., Endarle, Blanchard & Bronzino, Academic
PROFESSIONAL ELECTIVE-I

7 BM 05 BIO-INFORMATICS

UNIT I: Introduction to genomics:
Information flow in biology, DNA sequence data, experimental approach to genome sequence data, genome information resources.

UNIT II: Functional proteomics:
Protein sequence and structural data, protein information resources and secondary data bases. NBFR-PIR, SWISSPROT

UNIT III: Introduction to Genomic data and Data Organization:
Sequence Data Banks, Introduction to sequence data banks, Signal peptide data bank, Nucleic acid sequence data bank, GenBank, EMBL, nucleotide sequence data bank, and AIDS virus sequence data bank. tRNA data bank, structural data Bank

UNIT IV: Computation genomics:
Internet basics, biological data analysis and application, sequence and data bases, NCBI model, file format, Perl programming, bioperl, introduction and overview of human genonic project.

UNIT V: Sequence alignment and data base search:
Protein primary sequence analysis, DNA sequence analysis, pairwise sequence alignment, FASTA algorithm, BLAST, multiple sequence alignment, DATA base searching using BLAST and FASTA.

UNIT VI: Structural data bases:
Small molecules data bases, protein information resources, protein data bank, genebank, swissprot, enterz.

TEXT/REFERENCE BOOKS:
1. Introduction to bioinformatics, Atwood, Pearson education.
2. Introduction to bioinformatics, Arther M.Lesk-OUP
4. Introduction to bioinformatics computer skills, Cynthia Gibas and Per Jambeck, 2001 SPD.

7BM 06 BIOMEDICAL SIGNAL PROCESSING -LAB:-
List of Practicals:
1. Sine wave generation using C.
2. Designing an FIR filter using MATLAB and DSP Kit.
3. Designing an IIR filter using MATLAB and DSP Kit.

5. Time frequency domain properties of different windows using MATLAB.
7. Design of Notch filter for elimination of 50Hz from ECG signal.
8. EMG processing using MATLAB, Rectification and Signal Averaging.

7BM 07 MEDICAL EXPERT SYSTEMS -LAB
Practicals: Minimum eight practicals based on syllabus

7BM 08 HOSPITAL ENGINEERING & MANAGEMENT -LAB
Laboratory Work:- Minimum 8 Case Study based on syllabus to be conducted in Hospitals.

7BM 09 PROJECT AND SEMINAR

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SEMESTER-EIGHTH

8 BM 01 PROFESSIONAL ETHICS AND VALUES

UNIT I: Science, Technology and Engineering as knowledge and as Social and Professional Activities Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of the Club of Rome.


UNIT III: Ethics of Profession:
Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

UNIT IV: Profession and Human Values:
Values Crisis in contemporary society. Nature of values: Value Spectrum of a good life.

UNIT V: Psychological values: Integrated personality; mental health. Societal values: The modern search for a good society, justice,
democracy, secularism, rule of law, values in Indian Constitution. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity.

UNIT VI: Moral and ethical values:
Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Reference Books:

8BM02 BIO MEDICAL IMAGING SYSTEMS

UNIT I: Digital image fundamentals: Image digitization, sampling and quantization, neighbourhood of pixels, connectivity, relations, equivalence and transitive closure, distance measures, arithmetic/ logic operations, discrete transform, fast Fourier transform, 2-D Fourier transform, inverse Fourier transform.

UNIT II: Image enhancement fundamentals: Spatial domain method, frequency domain method, contrast enhancement, histogram processing, image smoothing, image averaging, asking, image sharpening, removing of blur caused by uniform linear motion, enhancement in the frequency domain (low pass, high pass, mean and band-pass filtering).


UNIT IV: Image compression and segmentation fundamentals: Fidelity criteria, image compression models, loss and lossless compression technique.

UNIT V: Image segmentation: Point detection, line detection, edge detection, edge linking and boundary detection.

UNIT VI: Algorithms used in medical image processing: Brief of reconstruction techniques (algebraic, simultaneous iterative and simultaneous algebraic). Reconstruction algorithm for parallel projections, fan beam projection and back projection. Introduction to various approaches of pattern recognition.

8BM03 BIO INSPIRED ALGORITHM


UNIT II: Neural Network Methodologies: A taxonomy of NNs, the multilayer perceptron, training MLP, Practical issues in training MLP, Radial basis function network, Self organizing Maps, Implementation of a SOM.


UNIT IV: Grammatical Evolution: Biological analogy, Mapping process, mapping example, mutation and crossover in GE, recent development in GE, Search engine, meta-l grammars, δ GE, applications and alternative.

UNIT V: Particle Swarm model: PSO algorithm, constriction coefficient Ver, Parameter setting for PSO, Discrete PSO, comparing PSO and the GA, MLP swarm hybrids, grammatical swarm.


TEXT BOOKS:
1. Handbook of Bioinspired Algorithms and Applications Stephan Olariu, Hardcover
3. Biologically inspired algorithms for financial modelling, Anthony Brabazon, Michael O'Neill
UNIT I: Fluids and non-fluids, continuum coordinate systems, force and moments, stress at a point, rate of strain, properties of fluids, classification of fluids.

UNIT II: Different types of fluid flows, laminar and turbulent flow, transition from laminar to turbulent flow, laminar flow-annulus, laminar flow between parallel plates, measurement of viscosity.

UNIT III: Development of boundary layer, estimates of boundary layer thickness, boundary layer equation, nature of turbulence, smooth and rough surface, boundary layer separation.

UNIT IV: Friction loss in flow in a tube, velocity distribution of aortic system, waveform of pressure and velocity in aorta.

UNIT V: Wave reflections and impedance in arterial segments, blood flow in veins and blood flow in capillaries.

UNIT VI: Control theory and system analysis, mechanical analysis of circulatory systems, basic concept of myocardial mechanics, index of contractibility, fluid dynamics of aortic and mitral valves.

TEXT BOOKS:

8 BM 04 BIO MEDICAL EMBEDDED SYSTEMS DESIGN

UNIT I: MCS 51 Microcontroller family
Introduction to MCS family, Comparison of microprocessor and microcontroller, Features, Architecture, functional pin description, SFRs, various resources of MCS-51 Hardware Review: Study of Port structure, Interrupt structure, Timer/Counter, Serial port.

UNIT II: 8051 Assembly Language Programming
Addressing modes, Instruction set, Assembly Language Programming, CPU timings, 8051A as a Boolean Processor, Power Saving Options, 8051 I/O expansion using 8255, Typical MCS51 based system, Multiprocessor Communication in MCS-51, interfacing problems

UNIT III: Embedded Systems:
Basic concepts, requirements, categories, design challenges Embedded operating system Types, Hardware architecture,

UNIT IV: Embedded System Development
The development process, requirements engineering, design, implementation, integration and testing, packaging, configuration management, management of development projects

UNIT V: The execution environment
Memory organization, system space, code space, data space, unpopulated memory space, i/o space, system start up, interrupt response cycle, Functions Calls & Stack Frames, run time environment.

UNIT VI: Architecture of Kernel, Tasks and Task Scheduler – Task States, Content Switching, Scheduling Algorithms, Rate Monotonic Analysis, Task management Function Calls, Interrupt Service Routines, Semaphores, mutex, mailboxes, message queues, event registers, pipes, signals, memory management, Priority Inversion Problem Design methodologies and design flows, case studies- fetal heart rate monitor, versatile drop foot stimulator, myoelectric arm, telemonitoring system

TEXT BOOKS:
1. The 8051 microcontrollers-Kenneth J Ayala
2. Rajkamal, Embedded systems-architecture, programming and design,Tata McGraw Hill
4. David E. Simon -An Embedded Software Primer Pearson Education

REFERENCE BOOKS:
1. Muhammad A Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education
3. Embedded Microcomputer Systems- Real time Interfacing Í Valvano
8BM 05  BIO MEDICAL IMAGING SYSTEMS - LAB

[Students are required to perform at least Eight experiments]
1. Maximum distance algorithm
2. Image enhancement – Histogram
3. Image smoothing
4. Image sharpening
5. Algorithm for low pass filter, high pass filter, median filter
6. Point detection
7. Line detection
8. Edge detection

8 MB 06  BIO MEDICAL EMBEDDED SYSTEM DESIGN - LAB

Term work:
Minimum 10 experiments on MCS 51

List of Experiments
1. Interfacing with 8085 microprocessor and 8051 microcontroller
   a) Traffic light controller
   b) 7-segment display
   c) Analog to Digital Converter
   d) Matrix keyboard
   e) LCD display
   f) Digital to Analog Converter
   g) Stepper motor
   h) DC- motor
2. Interfacing of matrix sensors to PIC microcontroller
   a) Heart rate monitor
   b) ECG sensor
   c) Carbon dioxide and oxygen sensors
   d) Ion selective sensors
   e) Analog interfacing of rabbit core modules
   f) OP 7200 LCD display controller

8 BM 07  PROJECT AND SEMINAR

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