

SPPU B.E./B.Tech EE Sem 5 syllabus

Advance Microcontroller and its Applications

303141: Advance Microcontroller and its Applications

Credit 05

Unit 01 : PIC Architecture

Comparison of CISC and RISC, RAM and Program memory organization, Program counters, Stack pointer, Bank Select Register, Status register, Data transfer instructions, Arithmetic and logical instructions. Assembly language programs.

Unit 02 : Assembly language programming

Addressing Modes for PIC 18 microcontroller, Branch instruction, CALL, RETURN, Bit addressable instruction. Assembly language programs I/O ports, SFR related to PORTs, I/O port programming.

Unit 03 : Programming of PIC microcontroller in C

Embedded C concepts, Header and source files and pre-processor directives, Data types, data structures, Control loops, functions, bit operations. I/O port programming in C, Delay programming. PIC 18 Timer 0 Programming in C

Unit 04 : Special Hardware features and Programming

Timers required for CCP Applications, CCP module in PIC 18 microcontroller, Applications of CCP mode Generation of waveform using Compare mode of CCP module. Period measurement of a unknown signal using Capture mode in CCP module, Speed control of DC motor using PWM mode of CCP module

Unit 05 : Interrupt programming :

Interrupt Programming, Programming of Timer interrupts, Programming of External interrupts, Serial port programming. Interfacing of PIC18F458 8 bit model LCD(16x2)

Unit 06 : Interfacing of PIC Microcontroller

PIC ADC, Programming of ADC using interrupts, Measurement of temperature and voltage Using PIC microcontroller. Interfacing DAC with PIC18F458, Interfacing of Electromechanical Relays and Opto-isolators.

Text Books:

[T1] PIC Microcontroller and Embedded Systems Using Assembly and C for PIC18 by Muhammad Ali Mazidi, Rolind D. McKinley, Danny Causey, Pearson Education.

[T2] Fundamentals of Microcontrollers and Applications in Embedded Systems with PIC by Ramesh Gaonkar, Thomson and Delmar learning, First Edition.

[T3] Programming And Customizing the PIC Microcontroller by MykePredko, TATA McGraw-Hill.

[T4] PIC microcontroller: An introduction to software and Hardware interfacing by Han- Way-Huang Thomson Delmar Learning.

[T5] Microcontroller Theory and Applications with PIC18F, M.Rafiquzzaman, John Wiley and Sons

Reference Books:

[R1] PIC18F458 datasheet

[R2] MPLAB IDE user guides

[R3] MICROCHIP Technical Reference Manual of 18F4520 Embedded Design with PIC 18F452 Microcontroller by John B. Peatman, Prentice Hall

Electrical Machines-II

Electrical Machines-II

Unit - 1 Three phase Synchronous machines

Three phase Synchronous machines:

Construction, rotating-field type and rotating-armature type, salient-pole and non-salient-pole type and their comparison. Excitation Methods.

Three phase Synchronous generator (cylindrical rotor type): Principle of operation. Emf equation and winding factors (No derivation), rating of generator. Generator on no-load and on balanced load. Armature reaction and its effect under different load power factors. Voltage drop due to armature resistance, leakage flux and synchronous reactance. Per phase equivalent circuit and Phasor

diagram. Power - power angle relation.

Three phase Synchronous generator (salient pole type):

Armature reaction as per Blondel's two reaction theory for salient-pole machines, Direct-axis and quadrature-axis synchronous reactance's and their determination by slip test. Phasor diagram of salient-pole generator and calculation of voltage regulation.

Unit - 2 Voltage regulation of Three phase Synchronous generator

Performance of open circuit and short circuit test on synchronous generator, determination of voltage regulation by emf, mmf, and Potier triangle methods. Determination of voltage regulation by direct loading. Short circuit ratio.

Parallel operation of 3-phase alternators:

Necessity, conditions, Load sharing between two alternators in parallel (Descriptive treatment only). Process of synchronizing alternator with infinite bus-bar by lamp method (one dark & two equally bright lamp method) and by the use of synchroscope, Synchronizing current, power and torque (no numerical).

Unit - 3 Three phase synchronous motor

Principle of operation. Methods of starting. Equivalent circuit, significance of torque angle, Losses, efficiency and Power flow chart. Operation of 3-phase Synchronous motor with constant load and variable excitation ('V' curves and 'inverted V' curves). Phenomenon of hunting and its remedies. Applications of 3-phase synchronous motors. Comparison of 3 phase synchronous motor with 3-phase induction motor.

Unit - 4 3-ph induction motor, Induction generator and special purpose motors

Speed control of three phase induction motor by various methods (Stator side and rotor side controls). Action of 3-phase induction motor as induction generator, applications of induction generator. Introduction to Energy Efficient three phase Induction Motor and Super Conducting Generator.

Special Purpose Motors : Construction, principle of working, characteristics, ratings and applications of Brush less D.C. motors,

Stepper motors (permanent magnet and variable reluctance type only), Permanent Magnet motor (A.C. & D.C.).

Unit - 5 A.C. series motor

Operation of D.C. series motor on a.c. supply, nature of torque developed, problems associated with AC. operation and remedies.

Compensated series motor: Compensating winding, conductively and inductively compensated motor. Approximate phasor diagram. Use of compoles for improving commutation. Ratings and applications of Compensated Series motors.

Universal motors: Ratings, performance and applications, comparison of their performance on A.C. and D.C. supply.

Unit - 6 Single phase induction motor

Construction of single phase induction motor, double field revolving theory. Equivalent circuit and torque-slip characteristics on the basis of double revolving field theory. Tests to determine the parameters of equivalent circuit and calculation of performance characteristics of motor. Methods of self-starting. Types of single phase induction motors: Split-phase motors (Resistor split-phase motor, Capacitor-start motor, Capacitor start and capacitor run motor and permanent capacitor motor). Comparison of 1-phase induction motor with 3-phase induction motor.

Industrial and Technology Management

Industrial and Technology Management

Unit 01: Introduction to Management and Economics

A) Management: Meaning, scope, function, and importance of management. Difference between administration and management.

B) Industrial Economics: Definition of economics, Demand and Supply concept, Demand Analysis. Types of Demand, Determinants of Demand, Law of demand and supply, Elasticity of demand and supply, Law of Diminishing Marginal utility, Demand forecasting: Meaning and methods.

C) Business Organizations: Line organization, Staff organization and Functional Organization, (Project, Matrix, Committee Organization.)

D) Business Ownership and its Types: Types of business ownership, Sole proprietorship, Partnership (Act 1934), LLP (Limited Liability

Partnership) (Act 2008). One person company, Joint Stock Company: Public Limited and Private Limited, Public Sector Undertaking (PSU).

Unit 02: Technology Management

- A) Technology Management: Definition of technology Management and its relation with society, development, application and its scope.
- B) Classification of Technology Management: Classification of technology management at various levels- its importance on National Economy, Ethics in technology management, Critical factors in technology management.

Unit 03: Intellectual Property Rights (IPR) & Human Resource Management (HRM)

- A) Introduction to Intellectual Property Rights (IPR): Meaning of IPR, Different forms of IPR, Patents, Criteria for securing Patents. Patent format and structure, Copy rights and trademark (Descriptive treatment only).
- B) Human Resource Management: Introduction, importance, scope, HR planning, Recruitment, selection, training and development, Performance management.

Unit 04: Quality Management

- A) Quality Management: Definition of quality, continuous improvement, Types of quality, Quality of design, Seven QC Tools, Poka Yoke (Mistake Proofing), Quality circles, Kaizen. TQM, 5S (Case study of Toyota, descriptive treatment). Six-Sigma. Basic software used for inventory management and quality management like Zoho inventory, Oracal, Netsuite, Vyapar, Quick book commerce.
- B) Quality Management Standards (Introductory aspects only):- The ISO9001:2000 Quality Management System Standard-The ISO14001:2004, ISO26000, ISO 10004:2012, ISO 9001:2012 ISO 9001:2016, Environmental Management System Standard.

Unit 05: Marketing and Financial Management

- A) Marketing Management: Meaning of Market, Marketing strategy, motives, market characteristics and its types, Perfect Competition, Monopoly, Monopolistic completion and Oligopoly. New product development, Product life cycle, Marketing and selling, methods of

selling, marketing planning. Market survey and market research, Online Marketing (Digital Marketing).

B) Financial Management: Definition of financial management, cost Concept, Types of costs (Fixed, Variable, average, marginal, and total cost) and methods of costing price, capital. Debit, credit, Profit and loss statement, Balance sheet, Depreciation Analysis, causes and significance, methods of calculation of depreciation, Taxation system, and type of taxes.

Unit 06: Motivational Theory and Entrepreneurship

A) Motivation: Introduction to Motivation, theories of work motivation, Content Theories: Maslow's Hierarchy of Needs, Herzberg's Two factor theory, McClelland's Three Needs Theory, McGregor's Theory X and Theory Y. Process Theories: Adam's Equity Theory, Vroom's Expectancy Theory, Taylor's Motivation Theory

B) Leadership: Importance of Leadership, Types of Leadership: Autocratic, Democratic and Laissez-Faire Leadership, qualities of good Leader. Group dynamics: Types and interactions of groups, stages of group dynamics: Norming, Storming, Forming, Performing and Adjourning.

C) Entrepreneurship: Importance and limitations of rational decision making, Decision making under certainty, uncertainty and risk. Incentives for small business development, Government policies and incentives, Case study on Small scale industries in India.

Electrical Installation, Design and Condition Based Maintenance

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Unit 01: Economics of Distribution Systems

Classification of supply systems (State Only)

(i) DC, 2-wire system, (ii) Single phase two wire ac system, (iii) Three phase three wire ac supply system, iv) Three phase four wire ac supply system. Comparison between overhead and underground systems (For above mentioned systems) on the basis of volume requirement for conductor. AC Distribution System: Types of primary and secondary distribution systems, calculation of voltage drops in ac distributors (Uniform and Non Uniform Loading) (Numerical).

Economics of power

transmission: Economic choice of conductor (Kelvin's law) (Derivation and Numerical). Distribution Feeders: Design considerations of distribution feeders; radial and ring types of primary feeder's voltage levels, energy losses in feeders.

Unit 02: Substation and Earthing

Substation: Classification of substations, Various equipment used in substation with their specifications, Bus bar arrangements in the substation: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

Earthing: Necessity of Earthing, Types of Earthing system (Equipment and Neutral), and Maintenance Free Earthing system. Methods of testing earth resistance, Different electrode configurations (Plate and Pipe electrode), Tolerable step and touch voltages, Steps involved in design of substation Earthing grid as per IEEE standard 80-2013.

Unit 03: Maintenance and Condition Monitoring

Importance and necessity of maintenance, different maintenance strategies like breakdown maintenance, planned/preventive maintenance and condition based maintenance. Planned and preventive maintenance of transformer, Induction motor and Alternators. Insulation stressing factors, Insulation deterioration, polarization index, dielectric absorption ratio. Concept of condition monitoring of electrical equipment. Advance tools and techniques of condition monitoring,

Thermography. Failure modes of transformer, Condition monitoring of oil as per the IS/IEC standards, Filtration/reconditioning of insulating oil, Condition monitoring of transformer bushings, on load tap changer, dissolved gas analysis, degree of polymerization. Induction motor fault diagnostic methods - Vibration Signature Analysis, Motor Current Signature Analysis. Hot Line Maintenance - Meaning and advantages, special types of non-conducting Materials used for tools for hot line maintenance.

Unit 04: Basics of Estimation and Costing

Purpose of estimating and costing, qualities of good estimator, essential elements of estimating and costing, tender, guidelines for inviting tenders, quotation, price catalogue, labor rates, schedule of

rates and estimating data (only theory).

Unit 05: Installation and estimation of distribution system

Introduction cable sizing, Estimation and conductor size calculations of internal wiring for Residential and Commercial (Numerical) installations and estimate for underground LT service lines.

Unit 06: Testing and Electrical Safety

Understanding CAT Ratings & Using CAT rated Instrument, Electrical Installation Testing Procedures- Insulation resistance test between installation and earth, Insulation resistance test between conductors (use of GUARD Terminal in IR test & Application) (methods used for IR Testing) Testing of polarity, Testing of earth continuity paths (Applications of PAT Tester “Portable Appliance Tester” in commercial like hotels, hospital & Industry also) and Earth resistance test (methods for earth testing 2-pole, 3-pole new methods clamp on type where we can performs test in Live) Contents of first aid box, treatment for cuts, burns and electrical shock. Procedures for first aid (e.g. removing casualty from contact with live wire and administering artificial respiration). Various statutory regulations (Electricity supply regulations, factory acts and Indian electricity rules of Central Electricity Authority (CEA), Classification of hazardous area. (Introduction to OSHA).