

BE ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER – VII

19E701 POWER SYSTEM PROTECTION AND SWITCHGEAR

3 0 0 3

PROTECTIVE RELAYS : Switchgears: essential features and equipments – types of fault - short circuit MVA: definition -Static relay – Advantages over Electromechanical relay- Universal relay torque equation - IDMT characteristics -Non-directional and directional over current relays – Principle of Earth fault and phase fault relays - Distance and Differential protection scheme - Negative sequence relays - Pilot (Translay) relay – Carrier current protection scheme. (9)

APPARATUS AND LINE PROTECTION : Alternator, transformer and Busbar protection schemes – Feeder Protection: radial and ring main system – 3 stage distance protection scheme – Current limiting Reactor : location and design - Microprocessor based protective schemes. (9)

CIRCUIT BREAKERS : Arc phenomenon – principles and methods of arc extinction - Recovery and restriking voltage - classification of circuit breakers – Problems and solution of circuit interruption – circuit breaker ratings – selection of circuit breakers - Fuses: types-selection-discrimination – concept of HVDC breakers. (9)

SURGE AND SURGE PROTECTION : Causes of overvoltages - Lightning phenomena – Traveling waves on transmission lines – specifications - Protections against lightning - Lightning arresters – Types – Surge absorbers. (9)

NEUTRAL GROUNDING AND INSULATION CO-ORDINATION : Problems in ungrounded neutral system – methods of neutral grounding – design of Arc suppression coil - Earthing transformers – Insulation co-ordination: BIL- Definition – Design of insulation co-ordination for sub-station equipments - Indian Electricity rules. (9)

Total L: 45

TEXT BOOKS:

- 1.Badri Ram, Vishwakarma D N, "Power System Protection and Switchgear", Tata McGraw-Hill, New Delhi, 2011.
- 2.Ravindranath B, Chander M, "Power System Protection and Switchgear", New Age International, New Delhi, 2011.

REFERENCES:

- 1.Soni M L, Gupta P V, Bhatnagar U S, Chakrabarti A, "A Text Book on Power Systems Engineering", Dhanpat Rai & Co., New Delhi, 2013.
- 2.Sunil S Rao, "Switchgear Protection and Power Systems", Khanna Publishers, New Delhi, 2012.
- 3.Y.G. Paithankar, S.R. Bhide, "Fundamentals of Power System Protection", PHI Learning Private Limited, New Delhi, 2010.
- 4.Ravindra P.Singh, "Switchgear and Power System Protection", PHI Learning Private Ltd, New Delhi, 2009.

19E702 POWER SYSTEM ANALYSIS

2 2 0 4

MODELING & NETWORK FORMULATION : Formation of Y Bus – pi-equivalent circuit of transformer with off-nominal tap ratio - Z bus formation by using building algorithm Modeling of power system components - single linediagram- Per unit representation – advantages –Per unit reactance diagram- Primitive network. (7 + 7)

SHORT CIRCUIT STUDIES : Types of faults – Symmetrical components - Algorithms for fault calculations — positive, negative and zero sequence networks and impedance matrices – Analysis of Symmetrical and unsymmetrical fault using Zbus. (6 + 6)

LOAD FLOW STUDIES : Formulation of load flow problem - bus classification – Load flow solution by Gauss - Seidal, Newton - Raphson and Fast decoupled methods - Comparison -. Computation of slack bus power, transmission loss and line flow.(5 + 5)

UNIT COMMITMENT AND ECONOMIC DISPATCH : Formulation of economic dispatch problem – I/O cost characterization – incremental cost curve – coordination equations without and with loss (No derivation of loss coefficients) – solution by direct method and λ -iteration method – statement of unit commitment problem – Dynamic programming method (6 + 6)

STABILITY STUDIES : Steady state and transient stability - Swing equation and its solution by Runge-Kutta method – Equal area criterion and its Application -methods of improving transient stability-Power quality problems-issues and causes (6 + 6)

Total L: 30 +T: 30 = 60

TEXT BOOKS:

1. Haadi Saadat, "Power System Analysis", 1st edition, Tata McGraw-Hill, New Delhi, 2011.
2. D.P.Kothari, J.Nagrath, "Modern Power System Analysis", Tata McGraw-Hill, New Delhi, 2013.

REFERENCES:

1. Gupta B R , "Power System Analysis and Design", S.Chand & Company Ltd., New Delhi, 2016.
2. Abhijit Chakrabarti, Sunita Halder, "Power System Analysis, Operation and Control", Prentice Hall, India, New Delhi, 2012.
3. M.A.PAI, "Computer Techniques in Power System Analysis", Tata McGraw-Hill, New Delhi, 2006.

4. Roger C.Dugan, "Electrical power systems quality", Tata McGraw-Hill, New Delhi, 2012.

19E710 POWER SYSTEM LABORATORY

0 0 2 1

LIST OF EXPERIMENTS: :

- 1) Study of Transmission line hardware model
- 2) Formation of a bus admittance matrix (YBus)
- 3) Formation of a bus impedance matrix (ZBus)
- 4) Determination of String efficiency of suspensions insulator
- 5) Determination of sequence impedances of 3-phase Alternator
- 6) Symmetrical and Unsymmetrical short - circuit fault analysis
- 7) Solution of power-flow problem using Newton-Raphson method.
- 8) Differential protection of 1-phase Transformer.
- 9) Characteristics of static under-voltage/over- voltage relay
- 10) Characteristics of solar PV cell

Total P: 30

REFERENCES:

1. Hadi Saadat, "Power System Analysis", Tata McGraw-Hill., New Delhi, 2011.
2. Department of EEE, "Power Systems Engineering Laboratory Manual", PSGCT, Coimbatore, 2019.

19E720 PROJECT WORK I

0 0 4 2

Students will do the following:

- * Identification of project
- * Define the objectives of the project
- * Literature Survey
- * Finalisation of System Requirements and Specifications
- * Development of software / Hardware Model
- * Testing/Validating and obtaining Results
- * Future Trends/Extension of the project
- * Consolidated Report Preparation

Total P:60

SEMESTER - VIII

19E820 PROJECT WORK II

0 0 8 4

Students will do the following:

- * Identification of project
- * Define the objectives of the project
- * Literature Survey
- * Finalisation of System Requirements and Specifications
- * Development of software / Hardware Model
- * Testing/Validating and obtaining Results
- * Future Trends/Extension of the project
- * Consolidated Report Preparation

Total P:120

PROFESSIONAL ELECTIVES

19E001 FLEXIBLE AC TRANSMISSION SYSTEMS

3 0 0 3

INTRODUCTION : Fundamentals of AC power transmission, transmission problems and needs, emergence of FACTS-FACTS control considerations, FACTS controllers (5)

SHUNT COMPENSATORS : COMPENSATORS Need for shunt controllers - Principle and operation of SVC- transient stability

improvement-power oscillation damping. Methods of controllable VAR generation- types - Variable Impedance type & switching converter type – Static Synchronous Compensator (STATCOM) - configuration, characteristics and control-applications (10)

SERIES COMPENSATOR : Principles of operation- types - static series compensation using GCSC, TCSC and TSSC, Static Synchronous Series Compensator (SSSC) – characteristics and control-applications. (10)

VOLTAGE REGULATORS AND PHASE SHIFTERS : Principles of operation-types -Steady state model and Characteristics of a static voltage regulators and phase shifters- power circuit configurations-applications. (10)

UNIFIED POWER FLOW CONTROLLER : Principles of operation – characteristics - independent active and reactive power flow control - applications. Comparison of UPFC with the controlled series compensators and phase shifters. (10)

Total L: 45

TEXT BOOKS:

1. Hingorani, L.Gyugyi, "Understanding FACTS - Concepts and Technology of flexible ac transmission system", IEEE Press, New York, 2000.
2. K.R.Padiyar, "FACTS controllers for transmission and Distribution systems", New Age international Publishers, New Delhi, 2007.

REFERENCES:

1. R .Mohan Mathur and Rajiv K.Varma, "Thyristor - based FACTS controllers for Electrical transmission systems", ISBN no. 0-471-20643-1, IEEE press, Wiley Inter science, New York, 2002.
2. P. Kundur, "Power system stability and control", McGraw-Hill, New York, 1994.
3. Enrique Acha, Claudio R. Fuerte-Esquivel, Hugo Ambriz-Pérez, César Angeles-Camacho , "FACTS: Modelling and Simulation in Power Networks", John Wiley & Sons, London, 2004.
4. Hirofumi Akagi, Edson Hirokazu Watanabe, Mauricio Aredes, "Instantaneous Power Theory and Applications to Power Conditioning", John Wiley & Sons, New Jersey, 2017.

19E002 SPECIAL MACHINES AND CONTROLLERS

3 0 0 3

STEPPER MOTORS : Types - Constructional features - principle of operation - variable reluctance motor - Single and Multi-stack configurations - Permanent Magnet Stepper motor - Hybrid stepper motor - Different modes of Excitation - theory of torque predictions - Speed-Torque Characteristics - Drive systems and circuit for open-loop and closed-loop control of stepper motor - NEMA Frame size - Selection of Stepper motor (9)

SWITCHED RELUCTANCE MOTORS : Constructional features and configurations - principle of operation - Inductance Profile - Torque Equation - Power Converters for SR Motor - Rotor Sensing Mechanism – Sensorless Control of SR motor - Applications (8)

PERMANENT MAGNET MOTORS : Types - PMDC - BLDC - PMSIM - Construction - Principle of operation - EMF and torque equations - Torque speed characteristics - Magnetic circuit analysis - BH curve - Magnet - Lamination - Power controllers - Applications (13)

SYNCHRONOUS RELUCTANCE MOTORS (SYNRM) : Construction - Principle of operation - Rotor Configurations - Phasor diagram and torque equation - Control system for SynRM Drive - Applications of SynRM (7)

LINEAR MOTORS : Linear Induction Motor (LIM) classification - construction - Principle of operation - DC Linear Motor (DCLM) types - control applications - Linear Synchronous Motor (LSM) - Types and Applications (4)

SERVOMOTORS : Servomotor - Types - Constructional features, principle of operation - Servo Drives (4)

Total L: 45

TEXT BOOKS:

1. Kenjo T, "Stepping Motors and their Microprocessor Controls", Clarendon Press, London, 2003.
2. K. Venkataratnam, "Special Electrical Machines", University Press, India, 2009.

REFERENCES:

1. Berker Biglin, James Weisheng Jiang, Ali Emadi, "Switched reluctance Motor drives: Fundamentals to Applications", CRC Press, New York, 2019.
2. Ion Boldea, Lucian Tutelea, "Reluctance Electric machines: design and control", CRC Press, New York, 2019.
3. J. R. Hendershot, TJE Miller, "Design of Brushless Permanent-magnet Machines", Motor Design Books, 2010.
4. Miller T J E, "Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press, Oxford, New Delhi, 1989.

19E003 UTILIZATION AND CONSERVATION OF ELECTRICAL ENERGY

3 0 0 3

ELECTRIC TRACTION : Requirements of traction system - Systems of traction - Systems of track electrification - Speed-Time

curves - Tractive effort - Power of traction motor - Specific energy consumption – Block Diagram of Modern Locomotive – Main and Auxiliary Power supply circuits – Current Collection Systems -Motors for traction - Starting and speed control - Electric braking – Case Study Metro Rail System. (12)

ELECTRIC HEATING AND WELDING : Advantages of electric heating – Types of Heating - Resistance heating - Temperature control, Induction heating – induction furnace - Dielectric heating - Choice of voltage and frequencies for Dielectric heating. Equipments for Welding - Resistance welding - Arc welding - Laser welding – Ultrasonic Welding (8)

ILLUMINATION : Nature of light - Luminous intensity - Illumination - Brightness - Lamp efficiency - Luminous efficiency - Laws of illumination - Electrical sources of light - Fluorescent lamp, Sodium Vapour lamp, Mercury Vapour lamp – CFL – LED Lighting systems - Polar curves - Calculation of illumination - Indoor and outdoor Lighting schemes (8)

REFRIGERATION AND AIR CONDITIONING : Refrigeration Systems – Refrigerants – Types of Refrigeration Systems – Electrical Circuit of a Domestic Refrigerator – Trouble shooting of Refrigerator. Air Conditioning Systems – Types Electrical circuit of window and Central Air Conditioning Systems. (7)

ECONOMIC ASPECTS OF UTILISATION : PF and its improvement - Load curves - Load factors - Its improvement – Depreciation – Types. Introduction to Availability based Tariff - Demand side Management –Peak clipping – Peak shifting – valley filling - Use of off peak energy - Trends in Conservation : Green Buildings. Introduction to Energy conservation and Energy auditing - Case studies on Energy efficiency in thermal & electrical utilities. (10)

Total L: 45

TEXT BOOKS:

1. Garg G C, "Utilisation of Electric Power and Electric Traction", Khanna Publishers, New Delhi, 2004.
2. Openshaw Taylor E, "Utilisation of Electric Energy in SI Units", Universities Press, Hyderabad, 2011.

REFERENCES:

1. Wadhwa C L, "Generation, Distribution and Utilisation of Electrical Energy", New Age International Publishers, New Delhi, 2012.
2. Tripathy S.C, "Electric Energy Utilisation and Conservation", Tata Mc Graw-Hill, New Delhi, 1993.
3. Suryanarayanan N.V, "Utilisation of Electric Power Including Electric Drives and Electric Traction", New Age International Publishers, New Delhi, 2010.
4. Abbi Y P, Shashank Jain, "Handbook on Energy Audit and Environment Management", Teri Press, New Delhi, 2006.

19E004 ADVANCED CONTROL SYSTEMS

3 0 0 3

DESIGN OF COMPENSATOR AND CONTROLLERS : Compensator Design-Lead, Lag, Lag-Lead compensation - Realisation of compensator using Electrical Networks - Frequency Response of Compensator- Design using Bode Plot. Controller Design: P, PI, PID Controllers - Transfer function – Design – Tuning of PID Controller: Ziegler-Nichols tuning, Cohen Coon tuning Method. (9)

STATE SPACE ANALYSIS : Concept of State, State Variables and State Model - State Space representation using Physical, Phase and Canonical variables - State Transition Matrix – Solution of State equation – Controllability and Observability - Controller design using state feedback – Observer design using Ackermann's formula (9)

PHASE PLANE ANALYSIS : Features Non-Linear systems - Common physical Non-Linearities – Methods of linearizing Non-Linear systems - Concept of Phase Portraits – Singular points – Construction of Phase Plane– Isocline method – Existence of Limit cycles. (9)

DESCRIBING FUNCTION : Describing Function Fundamentals -Describing functions of common Non-Linearities – Describing function analysis of Non-Linear systems:- Limit Cycles - Dual input describing function for typical Non- Linearities: Relay, Hysteresis and Polynomial type Non-Linearity. (9)

STABILITY ANALYSIS : Introduction – Concept of Stability – Equilibrium points- Lyapunov's Stability theorems - Lyapunov's direct method for LTI systems – Lyapunov's method for Non-Linear systems - Krasovski's theorem on Lyapunov function (9)

Total L: 45

TEXT BOOKS:

1. Katsuhiko Ogata, "Modern Control Engineering", 5th Edition, Prentice Hall of India Learning Private Ltd, New Delhi, 2013.
2. Zoran Vukic, Ljubomir Kuljaca, Dali Donlagic, Sejid Tesnjak, "Nonlinear Control Systems", 1st Edition, Taylor & Francis Inc, United Kingdom, 2003.

REFERENCES:

1. Gopal M, "Digital Control and State Variable Methods", 4th Edition, Tata McGraw- Hill Ltd, New Delhi, 2003.
2. Benjamin Kuo, "Automatic Control Systems", 3rd Edition, Prentice Hall of India, New Delhi, 2010.
3. Horacio J Marquez, "Nonlinear Control Systems: Analysis and Design", 1st Edition, John Wiley & Sons Inc, United States, 2003.
4. Bandyopadhyay, M.N, "Control Engineering: Theory and Practice", 2nd Edition, Prentice-Hall of India Private Limited, New Delhi, 2003.

19E005 SMART GRID

3 0 0 3

INTRODUCTION TO SMART GRID : Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture (9)

WIDE AREA MONITORING SYSTEM : Fundamentals of Synchrophasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchrophasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU. (9)

SMART METERS : Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management. (9)

INFORMATION AND COMMUNICATION TECHNOLOGY : Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid. (9)

SMART GRID APPLICATIONS AND CYBER SECURITY : Applications : Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model. (9)

Total L: 45

TEXT BOOKS:

1. James Momoh, "SMART GRID : Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012.

REFERENCES:

1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.
2. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.
3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.
4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.

19E006 INDUSTRIAL AUTOMATION

3 0 0 3

INTRODUCTION TO FACTORY & PROCESS AUTOMATION: : Industrial Versions - Introduction to Architecture of Totally Integrated Automation (TIA) - Components of TIA and its Functions - Industrial Automation Control Elements IEC/ ISA symbols and Utilization category of Control Elements - Relay Ladder logic using control elements (6)

PROGRAMMABLE LOGIC CONTROLLERS : Architecture of PLC - Types of PLC - PLC Configuration - PLC modules - Selection criteria for PLC - PLC Wiring - Installation of PLC and its modules (5)

PROGRAMMING OF PLC : Types of Programming - Bit Instructions - Timers and counters - PLC arithmetic functions PTO / PWM generation - High Speed Counter - Analog Scaling - Encoder Interfacing - Servo drive control - Stepper Motor Control (12)

HMI SYSTEMS : Need for HMI in Industrial Automation, - Types of HMI - Configuration of HMI, Screen development and navigation - Configuration of HMI elements / objects and Interfacing with PLC (6)

SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) : Architecture - Tools - Tags - Graphics – Alarm logging - Tag logging - Trends - History - Report generation, Global Scripts for SCADA application (10)

INDUSTRIAL NETWORKING : Types and comparison of Industrial Buses - Proprietary and open Protocols - OLE/OPC - Networking standards & IEEE Standard - Introduction to EtherCAT - Applications of Various industrial Buses (6)

Total L: 45

TEXT BOOKS:

1. W. Bolton, "Programmable logic controllers", Elsevier Ltd, 2015.
2. Gordon Clarke, Deon Reyneders, Edwin Wright, "Practical Modern SCADA Protocols: DNP3, 60870.5 and Related systems", Newnes Publishing, 2004.

REFERENCES:

1. John R Hackworth and Fredrick D Hackworth Jr, "Programmable Logic Controllers: Programming Methods and Applications", Pearson Education, India, 2006.
2. SIEMENS, "SIMATIC Programming with STEP 7", SIEMENS Manual, 2014.
3. SIEMENS, "SIMATIC STEP 7 in the Totally Integrated Automation Portal", SIEMENS AG, 2012.
4. William T Shaw, "Cybersecurity for SCADA systems", PennWell, USA, 2006.

19E007 HVDC TRANSMISSION

3 0 0 3

GENERAL ASPECTS : Historical development of HVAC and HVDC system. HVDC system configuration and components comparison – Economic technical performance – Reliability – Limitations (6)

CONVERTER CIRCUITS AND ANALYSIS : Introduction to single phase and three phase converters. Converters for HVDC system – 6 pulse converter and 12 pulse converter (both LCC and VSC types). Analysis of 6 pulse converter with and without source impedance. – With overlap less than 60 degrees - With overlap greater than 60 degrees - Complete characteristics of HVDC converter – Rectifier mode and Inverter mode of operation- Equivalent circuits. (10)

CONTROL : Basic means of control – Power reversal – Constant current versus constant voltage control characteristics- Desired features of control. Ideal and actual steady state characteristics and combined rectifier and inverter characteristics. – Constant minimum delay angle control, constant current control, constant extinction angle control and tap changer control. (9)

MISOPERATION OF CONVERTERS AND HARMONICS : Introduction to converter disturbance- Causes and effects– By pass action in bridges -Commutation failure. Characteristic and un – characteristic harmonics – Troubles due to harmonics – Means of reducing harmonics. Need for reactive power – Sources of VAR (7)

POWER FLOW ANALYSIS IN AC/DC SYSTEMS : Modelling of DC links – DC network – DC converter – Controller equations – Solutions of DC load flow . Solution of AC-DC power flow (7)

PROTECTION : Basics of protection – DC reactors – Voltage and current oscillations – Clearing line faults and re- energising – Circuit breakers – Over voltage protection – Control of di/dt and dv/dt.-Introduction to multi terminal HVDC system. (6)

Total L: 45

TEXT BOOKS:

1. Kimbark E W, "Direct Current Transmission", Wiley Interscience, New York, 1971.
2. Arrillaga J, "High voltage Direct Current Transmission", 2nd Edition, IEEE Publications, London, UK, 2012.

REFERENCES:

1. S. Kamakshiah, V. Kamaraju, "HVDC Transmission", Tata McGraw-Hill, New Delhi, 2011.
2. Adamson C, Hingorani N G, "High Voltage Direct Current Power Transmission", Garaway Ltd, 1968.
3. Padiyar K R, "HVDC Transmission Systems", New Age International Publishers Ltd, New Delhi, 2002.
4. Chan-Ki Kim, Vijay K. Sood, Gil-Soo Jang, Seong-Joo Lim, Seok-Jin Lee, "HVDC Transmission: Power Conversion Applications in Power Systems", John Wiley and Sons, Singapore, 2009.

19E008 POWER QUALITY MANAGEMENT

3 0 0 3

INTRODUCTION : Definition of power quality – Power quality- Voltage quality. Terms and definitions: General Classes of Power Quality Problems- Concepts of transients – Short duration voltage variations - Long duration voltage variation. Voltage imbalance - Waveform distortion- Voltage fluctuation-Power frequency variation- Power quality terms - International standards of power quality- IEEE-IEC and Computer Business Equipment Manufacturers Associations (CBEMA) curve (8)

VOLTAGE SAGS AND INTERRUPTIONS : Sources of sags and interruptions - Estimating voltage sag performance. Thevenin's equivalent source - Analysis and calculation of various faulted condition. Voltage sag due to induction motor starting. Estimation of the sag severity - Mitigation of voltage sags, active series compensators. Static transfer switches and fast transfer switches (8)

OVER VOLTAGES : Sources of over voltages - Capacitor switching – Lightning - Ferro resonance. Mitigation of voltage swells - Surge arresters - Low pass filters - Power conditioners. Lightning protection – Shielding – Line arresters - Protection of transformers and cables. An introduction to computer analysis tools for transients (8)

REACTIVE POWER COMPENSATION AND HARMONICS : Effect of load pattern on reactive power and power factor correction-Harmonic distortion- Voltage and current distortion- Harmonics versus Transients. Power System Quantities under Non-sinusoidal Conditions.Harmonic indices. Harmonic sources from commercial and industrial loads. Locating harmonic sources.Power system response characteristics. Effect of harmonics. Inter- harmonics – Resonance. Harmonic distortion evaluation - Devices for controlling harmonic distortion – Passive and active filters (12)

DISTRIBUTED GENERATION AND POWER QUALITY : Introduction to distributed generation - Interface to the Utility System - Power Quality Issues - Operating Conflicts. Interconnection Standards- Industry standards efforts,Interconnection requirements, simple interconnection and complex interconnection (6)

POWER QUALITY MONITORING : Monitoring considerations. Power quality measurement equipment - Harmonic / spectrum

analyzer - Flicker meters – Disturbance analyzer. Applications of expert systems for power quality monitoring (3)

Total L: 45

TEXT BOOKS:

1. Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H. Wayne Beaty, "Electrical Power Systems Quality", McGraw Hill, 2012.
2. Sankaran.C, "Power Quality", CRC Press, Washington, D.C., 2002.

REFERENCES:

1. Math H.J.Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", IEEE Press, New York, 2000.
2. Arrillaga.J, Watson.N.R, Chen.S, "Power System Quality Assessment", John Wiley & Sons, England, 2000.
3. Barry W.Kennedy, "Power Quality Primer", McGraw-Hill, New York, 2000.
4. Math H. Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", 1st Edition, Wiley- IEEE Press, 2000.

19E009 POWER SYSTEM OPERATIONS AND CONTROL

3 0 0 3

INTRODUCTION : An overview of power system operation and control – Basic control loops - Operating states – System load variation – Load characteristics - Load curves and load-duration curve – Load factor – Diversity factor - Plant level and system level controls (9)

ACTIVE POWER – FREQUENCY CONTROL : Basics of speed governing mechanism and modelling – Speed-load characteristics - Control area concept – LFC control of a single-area system - Static and dynamic analysis of uncontrolled and controlled cases – Two-area system – Modelling - Static analysis of uncontrolled case – Tie line with frequency bias control – State variable model (9)

REACTIVE POWER–VOLTAGE CONTROL : Generation and absorption of reactive power – System voltage and Reactive power - Excitation control – AVR and its modelling - Static and dynamic performance analysis – Methods of voltage control: tap-changing transformer, SVC (TCR + TSC) and STATCOM - Secondary voltage control (9)

COMPUTER CONTROL OF POWER SYSTEMS : Concept of energy control centre – Functions – System monitoring – Data acquisition and control - System hardware configuration – SCADA and EMS functions - Network topology – State estimation – WLSE – Contingency Analysis - State transition diagram showing various state transitions and control strategies (9)

INTRODUCTION TO POWER SYSTEM DEREGULATION AND RESTRUCTURING : Motivation for Restructuring of power system – Electricity market entities and model – Benefits of Deregulation - Basic terminologies – Deregulation – International scenario – Milestones of deregulation in the world - Indian power sector – Past and present status – Growth of power sector in India (9)

Total L: 45

TEXT BOOKS:

1. Allen. J. Wood, Bruce F. Wollenberg and Gerald B.Sheble, "Power Generation, Operation and Control", 3rd Edition, John Wiley & Sons, Inc., Singapore, 2013.
2. S.K.Gupta, "Power System Operation Control & Restructuring", I K International Publishing House Pvt. Ltd, Delhi, 2015.

REFERENCES:

1. P S R Murthy, "Operation and control in Power Systems", 2nd Edition, CRC press, Delhi, 2011.
2. Sunita Halder, Abhijit Chakrabarti, "Power System Analysis Operation and Control", Third Edition, PHI learning Pvt. Ltd., New Delhi, 2010.
3. Kundur P, "Power System Stability and Control", 10th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. K. Uma Rao, "Power System: Operation & Control", 1st Edition, Wiley India Pvt. Ltd, New Delhi, 2012.

19E010 HYBRID ELECTRIC VEHICLES

3 0 0 3

VEHICLE FUNDAMENTALS : Vehicle movement - Vehicle resistance - Dynamic equation - Power train tractive effort and vehicle speed - Vehicle power plant and transmission characteristics - Vehicle performance - Operating fuel economy - Braking performance. (9)

ELECTRIC AND HYBRID ELECTRIC VEHICLES : History - Environmental impact - Configurations of electric vehicles - Performance of electric vehicles - Tractive effort in normal driving - Energy consumption - Concept and architecture of hybrid electric drive trains (9)

ELECTRIC PROPULSION SYSTEMS : Principle of operation and performance of DC motor drives - Induction motor drives - Permanent Magnetic Brushless DC Motor Drives - Switched Reluctance Motor Drives - Electric drive train design - Case study(9)

ENERGY STORAGE SYSTEMS : Electrochemical batteries - Ultra capacitors - Ultrahigh-speed flywheels – Hybrid sources -

Storage system design aspects

(9)

FUEL CELL VEHICLES : Operating principle and characteristics - Fuel Cell Technologies - Fuel Supply - Fuel Cell Hybrid Electric Drive Train Design (9)

Total L: 45

TEXT BOOKS:

1. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, New York, 2009.
2. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, New York, 2011.

REFERENCES:

1. Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, Taylor & Francis Corp, New York, 2015.
2. Seref Soylu, "Electric Vehicles - The Benefits and Barriers", InTech Publishers, Croatia, 2011.
3. Aulice Scibioh M. and Viswanathan B, "Fuel Cells – Principles and Applications", University Press, India, 2006.
4. Barbir F, "PEM Fuel Cells: Theory and Practice", Elsevier, London, 2005.

19E011 HIGH VOLTAGE ENGINEERING

3 0 0 3

DIELECTRIC BREAKDOWN : Breakdown Mechanisms- breakdown of gaseous dielectrics: Streamer theory - Paschen's law – Corona discharges – Vacuum breakdown – Breakdown of Liquid dielectrics : Suspended Particle Mechanism - Cavitation and Bubble Mechanism - Stressed Oil Volume Mechanism - Maintenance of oil Quality – Breakdown in solid and composite dielectrics : intrinsic breakdown - electromechanical breakdown -failure due to treeing and tracking - thermal breakdown (10)

GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS : Generation of high DC voltage - Voltage Multiplier Circuits - Van de Graaff Generators - Generation of Power Frequency high voltage: Cascade Transformers - Resonant transformer - Generation of impulse voltages : Marx Circuit - Generation of Switching Surges - Impulse current generator - Triggering and control of impulse voltage generators. (9)

MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS : DC voltages measurement: Generating voltmeter - High Resistance with series ammeter – Measurement of high ac and impulse voltages: Capacitance Potential Dividers - Capacitance Voltage Transformers - Sphere Gap Measurements - Measurement of High Direct Currents: Hall Generators – Measurement of High Frequency and Impulse Currents - High current shunts - Rogowski Coils (9)

NON-DESTRUCTIVE TESTING : Measurement of direct current resistivity - dielectric loss and capacitance measurements: High-Voltage Schering-Bridge - Partial discharge (PD) measurements: Straight Detectors - Balanced Detection Method (8)

HIGH-VOLTAGE TESTING AND APPLICATION : Testing of Insulators and bushings - Testing of Isolators and circuit breakers - Testing of cables - Testing of Transformers - Testing of surge arresters - Application of high voltage engineering in food processing and biomedical industry –safety and electrical hazard. (9)

Total L: 45

TEXT BOOKS:

1. S.Naidu, V. Kamaraju, "High Voltage Engineering", 5th Edition, Tata McGraw Hill, New Delhi, 2013.
2. Peter Kuffel, W. S. Zaengl, "High Voltage Engineering: Fundamentals", Revised Edition, Elsevier India, New Delhi, 2013.

REFERENCES:

1. L.L. Alston, "High Voltage Technology", 1st Edition, Oxford University Press, London, 2011.
2. Wadhwa. C.L, "High Voltage Engineering", 3rd Edition, New age international publishers Ltd, New Delhi, 2012.
3. Subir Ray, "An Introduction to High Voltage Engineering", 2nd Edition, PHI Learning Private Limited, New Delhi, 2013.
4. Mazen Abdel-Salam, "High-Voltage Engineering: Theory and Practice", 2nd Edition, CRC Press, New York, 2018.

19E012 EMBEDDED SYSTEMS AND INTERNET OF THINGS

3 0 0 3

FUNDAMENTALS OF EMBEDDED SYSTEMS : Basic Terminologies – Characteristics of Embedded Computing Applications– Embedded Software Development Process – Challenges in Embedded System Design – Compiler Optimization Techniques – Performance Optimization – UML Diagrams - Examples (5)

EMBEDDED SYSTEM DESIGN USING MIXED SIGNAL PROCESSORS : GPIO- Interrupts –Timers – Watchdog Timers – Analog to Digital Converter – Serial Communication – Low Power Modes (10)

REAL-TIME OPERATING SYSTEMS : Concept of OS-based Software Development – Real-Time Operating Systems: Definition, Characteristics and Structure – Task Management: Classification, Structure, States, and Scheduling – Concept of Pseudo Multitasking and True Multitasking – Task Synchronization – Inter-task Communication – Features of FreeRTOS (10)

INTERNET OF THINGS : Introduction to Industry 4.0 – Machine to Machine (M2M) – Evolution of IoT - Consumer IoT vs Industrial IoT - Functional Components of a typical IoT System – Fog Computing - Introduction to Cloud Computing (6)

IOT PROTOCOLS : Physical and Data Link Layer Protocols: RFID: NFC, FFC, ZigBEE, Bluetooth Low Energy, Z- Wave, Wi-Fi, Wireless HART - Network Layer Protocols: IPv4, IPv6, TCP & UDP, 6LoWPAN - Application Layer Protocols: COAP, MQTT – Security Issues - IoT Applications: Health Care, Connected Vehicles, Smart Grid, Smart Home, and Smart City (14)

Total L: 45

TEXT BOOKS:

1. K V Shibu, "Introduction to Embedded Systems", 2nd Edition, McGraw Hill Education India Private Limited, India, 2017.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key Applications and Protocols", 2nd Edition, John Wiley and Sons Ltd, United Kingdom, 2012.

REFERENCES:

1. David A. Simon, "An Embedded Software Primer", 1st Edition, Pearson Education, India, 2002.
2. Qing Li, "Real-Time Concepts for Embedded Systems", 1st Edition, CRC Press, US, 2003.
3. Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Reed Elsevier Publications, Gurgaon, Haryana, 2009.
4. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons Ltd, UK, 2014.

19E013 SYSTEM DESIGN USING FPGA

3 0 0 3

SYSTEM DESIGN USING PLDS AND CPLD : Structure of PLDs – PAL16L8, PAL16R6 - Complex PLDs (CPLDs) – Altera Max 7000 series – PLD design process – Design of combinational and sequential circuits using PLDs – Adder -Sequence detector – counters - shift register - Design of state machines using Algorithmic State Machines (ASM) chart as a design tool.(9)

INTRODUCTION TO FIELD PROGRAMMABLE GATE ARRAYS (FPGA) : FPGA Generic structure-Types of FPGA – FPGA Programming techniques –Lookup table based FPGA- Multiplexer based FPGA – Xilinx Spartan II series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) – Input/output Blocks (IOB) – Programmable Interconnection Points (PIP) – Introduction to ACT 2 family - FPGA Design examples. (9)

VERILOG HDL : Digital Design with VerilogHDL – Identifiers - compiler directives - Modules and ports -data types - operands and operators - gate level modeling–User Defined Primitives- data flow modeling - behavioral modeling - structural modeling – switch level modeling. (9)

FUNCTIONS AND RTL SYNTHESIS : Function and Task – Timing and Delays – Test benches – Design of combinational and Sequential circuits using Verilog – Verilog HDL synthesis – Verilog HDL constructs for logic synthesis – logic synthesis design flow – RTL to gates. (9)

TESTING IN DIGITAL CIRCUITS AND DESIGN FOR TESTABILITY : Fault Models – Fault detection – Test vector generation- Fault simulation - Detection of faults in combinational logic circuits –Stuck-at-fault model – Boolean Difference– Path Sensitising method – Design for testability – Adhoc techniques – Scan path –Boundary Scan - Built-in-self test. (9)

Total L: 45

TEXT BOOKS:

1. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education India, New Delhi, 2019.
2. Nelson V P, Nagale H T, Carroll B D, Irwin J D, "Digital Logic Circuit Analysis and Design", Prentice Hall International, New Jersey, 1996.

REFERENCES:

1. Wayne Wolf, "FPGA based system design", Pearson Education, India, 2015.
2. MichealD.Ciletti, "Advanced Digital Design with the Verilog HDL", Pearson Education, India, 2017.
3. Ming-Bo Lin, "Digital System Designs and Practices: Using Verilog HDL and FPGAs", Willey Indian Edition, India, 2012.
4. Bhasker J, "A Verilog HDL Primer", BS Publications, India, 2007.

19E014 VLSI DESIGN

3 0 0 3

OVERVIEW OF VLSI DESIGN AND BASIC ELECTRICAL PROPERTIES OF CMOS CIRCUITS : VLSI design process - Architectural design - Logical design - Physical design - Layout styles – Full-custom – Semi-custom approaches- Basic Electrical Properties of CMOS Circuits : MOS Transistor – Threshold voltage - Pass transistor - Transmission gate - Basic DC equations - Second order effects - MOS modules - Small signal AC characteristics - CMOS inverter - DC characteristics - Inverter delay – Power consumption in CMOS gates – Static dissipation Dynamic dissipation. (10)

VLSI FABRICATION TECHNIQUES : An overview of wafer fabrication - Wafer processing - Oxidation - Patterning - Diffusion - Ion implantation - Deposition - CMOS processes – Nwell - Pwell - Twintub - Silicon on Insulator – CMOS process enhancements - Interconnect - Circuit elements - Latchup - Latchup prevention techniques (8)

LAYOUT DESIGN RULES & PARAMETERS ESTIMATION : Layer representations - Stick diagrams-CMOS design style - Design rules - Need for design rules - Mead Conway design rules - CMOS n-well / p-well lambda based design rules - Simple layout examples. Sheet resistance - Resistance estimation - Capacitance estimation - Driving large capacitive loads. (8)

CMOS CIRCUIT COMBINATIONAL AND SEQUENTIAL LOGIC DESIGN : CMOS circuit families-Static CMOS-Ratioed circuits- Pseudo nMOS- Cascode voltage switch Logic-Dynamic circuits; Domino Logic-Pass transistor circuits- CMOS Transmission gates-Structured design - Simple combinational logic design examples - Parity generator – Multiplexers. Sequential logic design: Clocked sequential circuits –Single phase clocking -Max-delay Constraints- Min-delay Constraints - Two-phase clocking - Charge storage - clock skew- Clocked CMOS (C2MOS) - Logic-CMOS Dynamic register element - Dynamic shift register – Semi-static register – CMOS Latches- D- flip-flop. (10)

SUBSYSTEM DESIGN PROCESS : General arrangement of a 4-bit arithmetic processor - Design of a 4-bit shifter - Design of an ALU subsystem - Implementation of ALU functions with an adder - Carry look ahead adder – Multipliers – Serial-parallel multipliers - Pipelined multiplier array. (9)

Total L: 45

TEXT BOOKS:

1. Douglas A Pucknell, and Kamran Eshraghian, "Basic VLSI design", Prentice Hall of India, New Delhi, 2015.
2. Neil H E Weste, David Harris, "CMOS VLSI design: Circuits and System Perspective", Pearson Education, New Delhi, 2015.

REFERENCES:

1. Jan M Rabaey, Chandrakasan A, Nikolic B, "Digital Integrated Circuits", PHI Learning, NewDelhi, 2013..
2. Amar Mukherjee, "Introduction to nMOS and CMOS VLSI System Design", Prentice Hall, New Jersey, 1986.
3. Wayne Wolf, "Modern VLSI Design: Systems on Chip Design", Pearson Education, New Delhi, 2008.
4. John P. Uyemura, "Chip Design for Submicron VLSI Design: CMOS Layout and Simulation", Cengage Learning, New Delhi, 2010.

19E015 MIXED SIGNAL VLSI DESIGN

3 0 0 3

ANALOG CIRCUIT BUILDING BLOCKS : Switches- Active Resistors-Current Sources and Sinks-Current Mirrors – Simple – Wilson – Cascode - Folded – Cascode. Voltage and Current References – General biasing circuits for analog design – Supply Independent biasing-Temperature independent biasing- Band gap voltage references – Comparators- Multipliers (11)

CMOS AMPLIFIERS : MOS inverting amplifier - Improving the performance of inverting amplifier - Single stage MOS amplifiers. T- CS stage - CG stage - Source Follower- Frequency response of amplifiers. Cascode and Folded cascode stage - Current amplifiers - output amplifiers - Differential amplifiers (10)

CMOS OP-AMPS : CMOS operational amplifiers - Uncompensated and compensated Op Amps – Noise performance of Op-Amps - Design techniques with examples - High performance CMOS Op-Amps (7)

SWITCHED CAPACITOR CIRCUITS AND PHASE LOCKED LOOPS : Switched capacitor resistors - Switched capacitor amplifier- Switched capacitor integrators.- Basic Architecture of Phase Locked Loops (PLLs) – Charge Pump PLLs- Applications. (8)

DATA CONVERTERS : Data Converter fundamentals, DAC Architectures: Current Switched - Resistive - charge redistribution – Hybrid - Segmented D/A Converters. ADC architectures – Flash - Pipeline – Integrating - Successive Approximation and folding A/D Converters (9)

Total L: 45

TEXT BOOKS:

1. Phillip Allen, Douglas Holdberg , "CMOS Analog Circuit Design", Oxford University Press, New Delhi, 2014.
2. David A Johns, Ken Martin, "Analog Integrated Circuit Design", second, John Wiley and Sons, New York, 2013.

REFERENCES:

1. Behzad Razav, "Design of CMOS Integrated Circuits", Tata McGraw Hill, New Delhi, 2017.
2. Roubik Gregorian, Gabor C. Temes, "Analog MOS Integrated Circuits for Signal Processing", John Wiley & Sons, New York, 2013.
3. Randall L Geiger, Phillip E Allen and Noel R Strader, "VLSI Design Techniques for Analog and Digital Circuits", McGraw Hill, New Delhi, 1990.
4. Jacob Baker R, Lee H W and Boyce D E, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India, New Delhi, 2010.

19E016 VIRTUAL INSTRUMENTATION

3 0 0 3

VIRTUAL INSTRUMENTATION : Concept & Architecture – Role of Hardware and Software in Virtual Instrumentation - Advantages of Virtual instruments over Conventional Instruments. (4)

SOFTWARE OVERVIEW : Graphical Programming-Advantages- LabVIEW environment: Front panel - Controls palette- Controls and Indicators- Block diagram- Functions palette-Functions and Libraries - Data flow programming - Creating simple Virtual Instruments- Editing -Debugging and Running a Virtual Instrument - Creating SUBVIs. (6)

PROGRAMMING STRUCTURES : Control Structures: FOR loops - WHILE loops - Creation of Local and Global variables. Selection structures: CASE structure - Sequence structures - Flat and Stacked structures - Arrays: Creation and array operations. Clusters - Assembling and disassembling of elements using cluster operations. Waveform graphs and charts - String functions and File I/O functions. (12)

DATA ACQUISITION AND I/O FUNCTIONS : DAQ architecture - connecting signal to DAQ boards - DAQ Assistant and I/O functions in LabVIEW - Measurement and Automation Explorer. (7)

INSTRUMENT CONNECTIVITY : GPIB Hardware & Software specifications - Serial Communication - RS232 - RS 485 standards- PXI / PCI: Controller and Chassis Configuration - configuration using VISA. (7)

APPLICATIONS OF VIRTUAL INSTRUMENTATION : Image Acquisition - Machine vision system - Machine Vision Hardware and Software - Introduction to IMAQ and IMAQ Vision. Motion Control: Components of a motion control system - Software for configuration - Prototyping and Development - General Applications. (9)

Total L: 45

TEXT BOOKS:

1. Sanjay Gupta, Joseph John, "Virtual Instrumentation using LabVIEW", Tata McGraw-Hill, New Delhi, 2010.
2. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", Prentice Hall of India, New Delhi, 2011.

REFERENCES:

1. National Instruments, "LabVIEW: Basics I & II Manual", National Instruments, Bengaluru, 2005.
2. Garry W Johnson, Richard Jennings, "LabVIEW Graphical Programming", Tata McGraw Hill, New Delhi, 2011.
3. Jeffrey Travis, Jim Kring, "LabVIEW for Everyone: Graphical Programming Made Easy and Fun", 3rd Edition, Prentice Hall of India Learning Private Limited, New Delhi, 2006.
4. Rick Bitter, Taqi Mohiuddin, Matt Nawrocki, "LabView: Advanced Programming Techniques", 2nd Edition, CRC Press, USA, 2006.

19E017 COMMUNICATION SYSTEMS

3 0 0 3

AM SYSTEM : Introduction to communication systems - Amplitude modulation theory - Frequency Spectrum - Representation - Power relation - AM Generation - Class C power Amplifier - Evolution & Description of SSB - Balanced Modulator - Advantages of SSB Transmission - AM transmitter - AM receiver - AM envelope detector - Superheterodyne receiver. (9)

FM SYSTEM : Frequency Modulation - Phase Modulation - Representation and Frequency spectrum of FM wave - Effects of noise on carrier- Pre-emphasis and De-emphasis -FM Generation : Direct method - Stabilized reactance modulator - FM Transmitter - FM Receiver - Comparison of Wide band and Narrow band FM. (9)

DIGITAL COMMUNICATION SYSTEM : Advantages of Digital Data transmission - Sampling - Pulse Code Modulation - Multiplexing - Source codes-Error control codes -Line codes. (9)

DIGITAL MODULATION SCHEMES : Digital amplitude modulation - Frequency Shift Keying and Phase Shift Keying - BPSK and QPSK- FSK transmitter and receiver. (9)

FIBRE OPTIC SYSTEM : History of fibre optics-Optical fibres versus Metallic cables-Optical fibre communication system-Light propagation through optical fibres-Fibre configurations-Acceptance angle and Acceptance cone- Losses in optical fibre cables - Light sources - Light detectors - Lasers. (5)

ADVANCED COMMUNICATION SYSTEMS : Cellular Telephone System - Spread Spectrum System – Multiple Access Techniques - Satellite Communication system (4)

Total L: 45

TEXT BOOKS:

1. George Kennedy, Bernard Davis, "Electronic Communication systems", 5th Edition, Tata McGraw-Hill, New Delhi, 2017.
2. Wayne Tomasi, "Advanced Electronic Communication Systems", 5th Edition, Pearson Education, New Delhi, 2013.

REFERENCES:

1. B.P.Lathi, "Modern Digital & Analog Communication Systems", 4th Edition, Oxford Publications, New York, 2017.
2. Theodore S Rappaport, "Wireless Communication", 2nd Edition, Pearson Education, New Delhi, 2018.
3. Simon Haykin, "Communication Systems", 5th Edition, Wiley Publications, Singapore, 2017.
4. Singal T L, "Wireless Communications", 1st Edition, Tata McGraw Hill, New Delhi, 2010.

19E018 AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS

3 0 0 3

INTRODUCTION : Current trends in modern automobiles – Drive by wire Systems -Vehicle functional domains and their requirements - Components of an Automobile Electronic system and their functions: Sensors, Actuators, Control Units and Software structure of Control units. (6)

AUTOMOBILE ELECTRICALS AND ELECTRONICS : Basic Electrical Components in an automobile - Starting system (Battery, Ignition Switch, Solenoid, Starter, Neutral Safety Switch), Charging system (Alternator Drive Belt, Alternator, Voltage Regulator), Fuses. Overview of Vehicle Electronic system - Driver - Vehicle - Environment system (Control and monitoring systems, Electronic systems of the vehicle and the environment) -General instrumentation block diagram - Typical instrumentation cluster lay out. (10)

EMBEDDED SYSTEM IN AUTOMOTIVE CONTEXT : Embedded systems in typical modern automobile - Distributed systems, Embedded components -- Engine Management system - Diesel / Gasoline system, Components, System architecture (H/W, S/W) - Body electronics systems, - Infotainment systems – Navigation, Car radio. (10)

ELECTRONICS CONTROL UNITS (ECUS) : ECUs and vehicle subsystems - Electronic systems of Power train subsystem, Electronic systems of Chassis subsystem, Electronic systems of Body subsystems (Comfort and Passive safety), Multimedia subsystems. Automobile sensors and actuators, Engine management system, Vehicle safety systems, Environmental legislation (Pollution Norms - Euro / Bharat standards). (10)

DIAGNOSTICS AND AUTOMOTIVE NETWORKING PROTOCOLS : Diagnostics procedure: Introduction – Diagnostics theory – on board and off board diagnostics – Diagnostics Link Connector (DLC) - CAN bus topology – Data transmission – CAN protocol – Over view of CAN controller - LIN bus: overview – Data transmission system - LIN protocol. (9)

Total L: 45

TEXT BOOKS:

1. Tom Denton, "Automobile Electrical and Electronics systems", Routledge Taylor & Francis Group, London & New York, 2002.
2. Nicolas Navet and Francoise Simonot-Lion, "Automotive Embedded Systems Handbook", CRC Press, USA, 2013.

REFERENCES:

1. Michel Parent & Furnio Harshima, Ljubo vlcic, "Intelligent Vehicle Technologies: Theory and Applications", 1st Edition, Butterworth-Heinemann publications, New Delhi, 2001.
2. Ronald K.J, "Automotive Electronics Handbook", 2nd Edition, McGraw Hill Publications, Columbus, 2009.
3. Norman P. Mansour, William Ribbens, "Understanding of Automotive Electronics", 5th Edition, Butterworth-Heinemann, United Kingdom, 2014.
4. Robert Bosch, "Automotive Electrics Automotive Electronics", 5th Edition, Springer, Germany, 2010.

19E019 WEARABLE ELECTRONICS

3 0 0 3

INTRODUCTION : Drawbacks of Conventional Systems for Wearable Monitoring, Applications of Wearable Systems, Recent developments – Global and Indian Scenario, Types of Wearable Systems, Components of wearable Systems, Physiological Parameters commonly monitored in wearable applications, Smart textiles, & textiles sensors, Wearable Systems for Disaster management, Home Health care, Astronauts, Soldiers in battle field, athletes, SIDS, Sleep Apnea Monitoring (8)

SMART SENSORS AND VITAL PARAMETERS : Vital parameters monitored and their significances, Bio-potential signal recordings (ECG, EEG, EMG), Dry Electrodes design and fabrication methods, Smart Sensors – textile electrodes, polymer electrodes, non-contact electrodes, MEMS and Nano Electrode Arrays, Cuff-less Blood Pressure Measurement, PPG, Galvanic Skin Response (GSR), Body Temperature Measurements, Activity Monitoring for Energy Expenditure, Respiratory parameters. (9)

WEARABLE COMPUTERS : Flexible Electronics, Signal Processors, Signal Conditioning circuits design, Power Requirements, Wearable Systems Packaging, Batteries and charging, Wireless Communication Technologies and Protocols, Receiver Systems, Mobile Applications based devices. Data processing and validation – Signal Processing Algorithms in wearable Applications (10)

WIRELESS BODY AREA NETWORKS : Wireless Body Area Networks – Introduction, Personal Area Networks (PAN), Application in Vital Physiological Parameter monitoring, Design of Sensor & Sink Nodes, Architecture, Communication & Routing Protocols, Security, Power and Energy Harvesting. (8)

ELECTRONIC TEXTILES : Concepts and development of electronic textile. Conductive Polymers and Fibers - Textile Fibres Used for Wearable Electronic Applications. Interfacing Circuits and Garments - Designing of Wearable fabrics integrated with Electronic materials and circuits. Design of Heat-Generating Circuit for Nichrome Fabric, Design of Communication Circuit for Copper Core Conductive Fabric. Design of Signal-Transferring Circuit form Optical Core Conductive Fabric. Design of Bullet Wound Intimation Circuit for Tele-intimation Fabric. (10)

Total L: 45

TEXT BOOKS:

1. Micheal R Neuman, Edward Sazonov, "Wearable Sensors: Fundamentals, Implementation and Applications", 1st Edition, Elsevier, USA, 2014.
2. Xiao ming Tao, "Wearable Electronics and Photonics", 1st Edition, CRC press, Manchester, 2005.

REFERENCES:

1. Kate Hartman, "Wearable Electronics: Design, Prototype and wear your own interactive garments, Maker Media",

- 1st Edition, Maker Media, Inc, USA, 2014.
- Elijah Hunter, "Wearable Technology", 1st Edition, Kindle Edition, USA, 2015.
 - Guang Zhong Yang, "Body Sensor Networks", 1st Edition, Springer, UK, 2014.
 - Xiaoming Tao, "Wearable Electronics and Photonic Wearable Electronics and Photonics, The Textile Institutes", 1st Edition, CRC Press, Manchester, 2005.

19E020 ELECTRONIC PRODUCT DESIGN

3 0 0 3

INTRODUCTION: The basic product development process- Product planning- Design and engineering- Procurement- Manufacturing – Functionality- Performance- User interface - Form factor- Battery life- Cost- Time To Market (TTM)- Reliability-Marketing and distribution-Service and Support. (8)

SYSTEM DESIGN : Top down design-Product concept-Innovation-Creativity- Validation -Communication-Product requirements-System architecture development- Trade-off analysis- Cost modeling-Circuit design-Physical and mechanical design-Tolerance and reliability. (8)

ELECTRONIC PACKAGING: : IC packaging: Leaded package, TABITCP package-COB, flip-chip, BGA, CSP-Discrete components-Board to board connectors-substrates-Escape routing-PCA/module design metrics-Electronic packaging metrics-I/O hardware : buttons, switches, dials and touch screens, speakers , microphones, antennas, and external connectors. (8)

MECHANICAL DESIGN : Housings-EMI shielding-Thermal management: High level thermal analysis, thermal issues in notebook computers-mechanical integration-DFMA analysis - quality in the design process: Quality control -quality assurance-quality functional deployment-assignment matrices-checklist-quality in the design process-concurrent design-risk analysis-quality in production. (10)

PORTABLE ELECTRONICS : Digital and analog processing: microprocessor, logic devices, microcontrollers, DSP, analog devices, sensors, wireless communication, system memory and mass storage - Displays: Display technologies-LCD-micro display-pen input-power sources- Battery technologies: Ni-Cd, alkaline,Ni-MH,lithium ion, lithium polymer, photovoltaic cells, fuel cells-product implementation-high level power analysis-Case study: Cellular phones-portable PCs-Personal digital assistants-digital imaging products. (11)

Total L: 45

TEXT BOOKS:

- Tony Ward and James Angus, "Electronic Product Design", 1st Edition, Chapman and Hall Publications, UK, 1996.
- Bert Haskell, "Portable Electronics Product Design and Development: For Cellular Phones, PDAs, Digital Cameras, Personal Electronics and More", McGraw-HILL, Newyork, 2010.

REFERENCES:

- Tim Williams, "EMC for Product Designers", 5th Edition, Newnes, UK, 2017.
- Nigel Cross, "Engineering Design Methods: Strategies for Product Design", 4th Edition, Wiley, UK, 2008.
- Kevin N Otto, Kristin L Wood, "Product design : techniques in reverse engineering and new product development", 4th Edition, Prentice Hall, New Delhi, 2009.
- Jordan P. W, "Designing Pleasurable Products: An Introduction to the New Human Factors", 1st Edition, Taylor and Francis, London, 2002.

19E021 DIGITAL IMAGE PROCESSING

3 0 0 3

DIGITAL IMAGE FUNDAMENTALS & IMAGE TRANSFORMS : Introduction – Elements of visual perception – Image sampling and Quantization – Basic relationships between pixels -Image Transforms: DFT – properties –DWT – properties. (9)

IMAGE ENHANCEMENT : Intensity transformation functions – Histogram processing - Spatial filtering: Correlation and convolution – Smoothing filters – Sharpening filters. (9)

IMAGE RESTORATION : Noise models – Restoration in the presence of noise only: spatial filtering – Linear, position-invariant degradation – estimating the degradation function – Inverse filtering – Wiener filtering. (9)

IMAGE SEGMENTATION : Point detection- line detection - Edge detection - Thresholding - Region based segmentation: Region growing by pixel aggregation - Region splitting and merging. (9)

IMAGE COMPRESSION : Image compression model – Redundancy-Lossless compression – Run-length coding – Huffman coding – Lossy compression – predictive coding –JPEG standards of Image Compression. (9)

Total L: 45

TEXT BOOKS:

- Gonzalez R.C, Woods R.E, "Digital Image Processing", 4th Edition, Pearson, New Delhi, 2018.
- Jayaraman S, Esakkirajan S, Veerakumar T, "Digital Image Processing", Tata McGraw Hill, New Delhi, 2015.

REFERENCES:

- Jain A.K, "Fundamentals of Digital Image Processing", Prentice Hall of India, New Delhi, 2019.
- Sridhar S, "Digital Image Processing", Oxford University Press, New Delhi, 2013.

3. William K Pratt, "Digital Image Processing", 4th Edition, Wiley India, New Delhi, 2011.
4. Munesh Chandra Trivedi, "Digital Image Processing", 1st Edition, Khanna Publishing, New Delhi, 2014.

19E022 ADVANCED DATA STRUCTURES

3 0 0 3

INTRODUCTION : Introduction to Analysis of Algorithms– Best Case and Worst Case complexities - Amortized time complexity - Complexity for bubble sort, quick sort.- Introduction to Divide and Conquer Algorithms, Greedy Algorithms, Non-deterministic Algorithms. (8)

SEARCHING, HASHING AND AVL TREES : **SEARCHING**: Introduction to Linear Search, Binary Search, and Binary Search trees - **HASHING**: Hash function – separate chaining – open addressing – linear probing – quadratic probing – double hashing - rehashing - **AVL TREES**: Definition – Height – Searching – insertion and deletion of elements, AVL rotations – Analysis (13)

MULTIWAY SEARCH TREES : Indexed Sequential Access – m-way search trees – B-Tree – Searching, insertion and deletion - B+ trees – Tries - Red-Black trees. (8)

BINOMIAL HEAP AND FIBONACCI HEAP : Binomial trees and binomial heaps – Operations on binomial heap – Structure of Fibonacci heaps – merge heap operations, decreasing a key and deleting a node – Bounding the maximum degree. (8)

GRAPHS : Definition – Representations (Adjacency matrix, packed adjacency list and linked adjacency list) – Network representation – Shortest path algorithm - Graph search methods (Breadth First and Depth First Traversals) – Minimum spanning tree. (8)

Total L: 45

TEXT BOOKS:

1. Yedidayah Langsam, Moshe J. Augenstein, and Aaron M. Tanenbaum, "Data Structures using C and C++", 2nd Edition, Pearson Education Inc., New Delhi, 2019.
2. Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest, "Introduction to Algorithms", 3rd Edition, PHI Learning, New Delhi, 2018.

REFERENCES:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education Inc., New Delhi, 2018.
2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson - Freed, "Fundamentals of Data structures in C", 2nd Edition, Universities Press India Pvt. Ltd., Hyderabad, 2018.
3. Adam Drozdek, "Data Structures and Algorithms in C++", 4th Edition, Cengage Learning, New Delhi, 2013.
4. Puntambekar A, "Data Structures Using C++", Technical Publications, Gujarat, 2014.

19E023 COMPUTER NETWORKS

3 0 0 3

INTRODUCTION : Introduction to Computer networks-Layered Architecture -ISO/OSI Model-TCP/IP Protocol Suite- Type of networks-Network Topology-Study of L2, L3 switches and Routers- Physical layer-Transmission media- Signal encoding techniques (9)

DATA LINK LAYER : Link Layer services-Framing-Error Control- Flow Control-Media Access Control-CSMA/CD- Token Ring-FDDI-Circuit Switching- Packet Switching- Addressing- VLANs-Wireless LANs. (9)

NETWORK LAYER : Network Layer Functions- Internet Protocol-IP address assignment-ARP-Routing table lookup-Routing and forwarding-Subnets-CIDR-NAT-IPv6-Multicasting-Broadcasting (9)

TRANSPORT LAYER : Overview of Transport Layer-UDP-Reliable Byte Stream(TCP)-Connection Management- Flow Control-Retransmission-Congestion control-congestion Avoidance-State Transition Diagram (9)

APPLICATION LAYER : Traditional Applications- WWW- DNS-DHCP-SNMP- FTP-TELNET-HTTP-SMTP-MIME-IMAP- POP3- WEB mail - Firewalls (9)

Total L: 45

TEXT BOOKS:

1. James F. Kurose, Keith W. Ross, "Computer Networking-A Top-Down Approach Featuring the Internet", 6th Edition, Addison-Wesley, New Delhi, 2017.
2. William Stallings, "Data and Computer Communications", 10th Edition, Prentice Hall/Pearson, New Delhi, 2017.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, "Computer networks- A Systems Approach", 5th Edition, Morgan Kaufmann Publishers,

- New Delhi, 2012.
2. Andrew S Tanenbaum, David Wetherall, "Computer Networks", 5th Edition, Pearson, New Delhi, 2017.
 3. Douglas E. Comer, "Internetworking With TCP/IP Vol I: Principles, Protocols, and Architecture", 6th Edition, Prentice Hall/Pearson, New Delhi, 2014.
 4. Behrouz A. Foruzan, "Data Communication and Networking", 5th Edition, McGraw-Hill, New York, 2017.

19E024 SOFTWARE PROJECT MANAGEMENT AND QUALITY ASSURANCE

3 0 0 3

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT AND PROJECT PLANNING : Software development as a project, Stakeholders in software project, Software product, process, resources, quality, and cost; Objectives, issues, and problems relating to software projects. Project Planning - Steps in project planning, Alternatives in planning. (9)

PROJECT EVALUATION & EFFORT ESTIMATION : Strategic assessment, Technical assessment, Cost-benefit analysis, Cash flow forecasting, Cost-benefit evaluation techniques, Break-even analysis, and Risk evaluation. Project Approach - Choosing development technology and methodology, Choice of process model, Prototyping, Incremental delivery. Effort Estimation -Problems in software estimation, Effort estimation techniques, Expert judgment, Estimation by analogy, Delphi technique, Algorithmic methods, Top-down and bottom-up estimation, Function point analysis, Object points, COCOMO model.(9)

ACTIVITY PLANNING &RESOURCE ALLOCATION : Sequencing and scheduling projects, Network Planning models-Precedence network – Critical Path, Shortening project duration. Nature of project resources, identifying resource requirement of activities, Allocating and scheduling resources, cost of resources, Standard, planned, and actual cost, Cost variance, time-cost trade-off. (9)

CONTRACT AND RISK MANAGEMENT : Outsourcing of products and services, Types of contracts, Stages in contract placement, Terms of contract, Contract monitoring and Acceptance testing. Managing People- Organizational behavior, Recruitment and placement, Motivation, Group behavior, Individual and group decision making, Leadership and leadership styles, forms of organizational structures. Risk Analysis and Management - Nature and categories of risk in software development, risk Identification, Risk assessment, Risk mitigation, monitoring and management, Evaluating schedule risk using PERT. (9)

SOFTWARE QUALITY ASSURANCE AND CONFIGURATION MANAGEMENT : Planning for quality, Product versus process quality management, Procedural and quantitative approaches, Defect analysis and prevention, Statistical process control, Pareto analysis, Causal analysis, Quality standards, ISO 9000, Capability Maturity Model, Quality audit. Configuration Management - Configuration management process, Software configuration items, Version control, change control, Configuration audit, Status reporting. (9)

Total L: 45

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell, "Software Project Management", 5th Edition, McGraw-Hill, London, 2011.
2. Pankaj Jalote, "Software Project Management in Practice", Pearson Education, London, 2002.

REFERENCES:

1. Rog Günther Ruhe, ClaesWohlin, "Software Project Management in a Changing World", Springer, London, 2014.
2. Stefan Wagner, "Software Product Quality Control", Springer, Berlin, 2013.
3. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", 8th Edition, McGraw-Hill, New York, 2014.
4. Ramesh Gopalswamy, "Managing Global Software Projects", Tata McGraw-Hill, New Delhi, 2006.

19E025 ADVANCED COMPUTER ARCHITECTURE

3 0 0 3

MEMORY AND INPUT/OUTPUT SUBSYSTEMS : Introduction - Computer architectural classification: Flynn's classification – Data flow versus Control flow computers – Parallelism in uniprocessor systems – Balancing of subsystem bandwidth – Parallel processing applications. Hierarchical Memory Structure: Memory hierarchy – Optimisation –Addressing schemes for main memory – Multiple module memories – Memory interleaving – Virtual Memory System: Concepts – Paged Memory System – Segmented memory System – Memory with Paged Segments – Memory allocation and Management: Classification of memory Policies – Optimal Load Control – Memory Management Policies – Cache Memory and Management: Characteristics – Cache Memory Organisation - Fetch and Main Memory Update Policies – Block Replacement Policies – Performance evaluation and enhancement – Input Output Subsystems: Characteristics – Interrupt Mechanisms and Special Hardware – I/O Processors and I/O Channels (12)

PIPELINING AND VECTOR PROCESSING : Principles of pipelining – Instruction and Arithmetic pipelines – Instruction prefetch and branch handling – Data buffering and Busing structures – Internal forwarding and Register tagging – Hazard detection and resolution – Job sequencing and Collision prevention – Vector Processing: Characteristics – Pipelined Vector Processing methods – Vectorization and Optimization methods. (9)

ARRAY PROCESSING : SIMD Array Processors - Masking and data routing mechanisms - Inter PE communications – Interconnection networks – Parallel Algorithms for Array Processors – Associative Array Processing-Systolic array processing (8)

MULTIPROCESSOR ARCHITECTURE : Functional structures: Loosely coupled multiprocessors – Tightly coupled

multiprocessors – Processor characteristics for multiprocessing – Multiprocessor scheduling strategies – Interconnection networks– Parallel memory organization – Parallel Algorithms for Multiprocessors (8)

INTRODUCTION TO RISC ARCHITECTURE : Instruction execution characteristics – Instruction execution charts – Register files – Register optimization – Reduced Instruction Set Architecture – RISC pipelining – RISC versus CISC (8)

Total L: 45

TEXT BOOKS:

1. Hwang K, and Briggs F A, "Computer Architecture and Parallel Processing", Tata McGraw–Hill, New Delhi, 2016.
2. Stallings W, "Computer Organization and Architecture: Designing for Performance", Pearson Education, Chennai, 2018.

REFERENCES:

1. David Patterson and John L Hennessey, "Computer Organization and Design: The Hardware/Software Interface", Elsevier, Waltham, 2012.
2. Kai Hwang, Naresh Jotwani, "Advanced Computer Architecture – Parallelism, Scalability and Programmability", Tata McGraw–Hil, New Delhi, 2013.
3. Jhon L Hennessey and David A Patterson, "Computer Architecture a Quantitative Approach", fifth, Elsevier, United States, 2012.
4. Sima D, Fountain T, Kacsuk P, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, United States, 2000.

19E026 INTERNETWORKING AND APPLICATIONS

3 0 0 3

INTRODUCTION : Overview of the Internet – Protocol layering – LAN - WAN –IEEE 802.3 – Wireless LANS : 1EEE 802.11, Bluetooth, WiMax (9)

INTERNET PROTOCOL : IPv4 - IPv6 – IPv6 migration- Internet Addressing - Datagram delivery in IPv4 and IPv6 - ICMP in IPv4 and IPv6- ARP-NAT- Multicasting - Routing Algorithms: BGP-RIP-SPF (9)

TRANSPORT LAYER PROTOCOLS : User Datagram Protocols (UDP) – Transmission Control Protocol (TCP) – Client Server Model of Interaction – Sequential and concurrent servers - Socket API – Socket operations – Accessing Domain names (9)

NETWORK MANAGEMENT AND MULTIMEDIA APPLICATIONS : SNMP – MIB – ASN.1 Notation - Voice and Video over IP – RTP- RTCP – RSVP – Quality of service - Mobility – Mobile IP – IPv6 mobility support – Voice and Video over IP – Online Payments -Secure Electronic Transactions (SET) (9)

INTERNET SECURITY AND FIREWALL : IPsec- Information policy- secure socket layer- SSL – TLS- Firewalls and Internet Access- Firewall rules- Implementation and packet filters – VPN (9)

Total L: 45

TEXT BOOKS:

1. Douglas E Comer, "Internetworking with TCP/IP : Principles, Protocols and Architecture", 6th Edition, Prentice Hall, New Delhi, 2014.
2. Behraouz A Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.

REFERENCES:

1. Andrew STanenbaum, David T.Wetherall, "Computer Networks", Pearson Education, New Delhi, 2010.
2. Kurose James F, Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 6th Edition, Addison- Wesley, New Delhi, 2017.
3. A.S.Godbole, Atulkahate, "Web Technologies:TCP/IP Architecture and Java Programming", Tata McGraw Hill, New Delhi, 2011.
4. Jochen Burkhardt, Horst Henn, Stefan Hepper, Klaus Rindtoroff, Thomas Schaeck, "Pervasive Computing – Technology and Architecture of Mobile Internet Applications", Pearson, New Delhi, 2012.

19E027 JAVA PROGRAMMING

3 0 0 3

OBJECT ORIENTATION IN JAVA : Introduction - Data Types - Operators - Declarations - Control Structures - Arrays and Strings - Input/output.-Java Classes - Fundamentals - Methods - Constructors - Scope rules - this keyword - object-based Vs object-oriented programming - -Inheritance-Reusability - Composing class - Abstract classes - Abstract Functions - Method Overloading and Method Overriding- Wrapper Classes. (9)

PACKAGES AND INTERFACES : Packages - Access protection - Importing packages - Interface - Defining and Implementing Interface - Applying Interface - Variables in Interfaces. (6)

EXCEPTION HANDLING : Fundamentals - Exception types - Uncaught Exception - Using Try and Catch – Multiple catch clauses - Nested Try statements - Throw - Throws - Java Built-in Exception - Creating the subclasses. (4)

MULTI THREADED PROGRAMMING : Java thread model - Priorities - Synchronization - Messaging - Thread class and runnable Interface - Main thread - Creating the Thread - Synchronization - Inter-thread Communication - Deadlock. (4)

I/O, APPLETS : I/O basics - Stream - Stream Classes - Predefined stream - Reading/Writing console input – Applet fundamentals - Native methods.- GUI Components - Applets - Java Scripts - AWT / Swings. (12)

NETWORK AND DATABASE PROGRAMMING : Fundamentals - Internet Addresses - Internet Protocols - DNS - Internet Services - Socket programming - U D P - TCP. JDBC - Database Connection and Table Creation - Execution of Embedded SQL Statements - ResultSet and ResultSetMetaData - Examples. (10)

Total L: 45

TEXT BOOKS:

1. Patrick Naughton, Herbert Schildt, "JAVA - The Complete Reference", Tata McGraw-Hill, New Delhi, 2011.
2. Deitel and Deitel, "JAVA - How to Program", Prentice Hall International, New Delhi, 2012.

REFERENCES:

1. Kenneth Litwak, "Pure Java 2: A Code-Intensive Premium Reference", Tech Media Publications, New Delhi, 2010.
2. Cay S Horstmann, Gary Cornell, "Core Java Volume I & 2", Pearson Education, New Delhi, 2013.
3. Herbert Schildt, "JAVA - The Complete Reference", Tata Mc-Graw Hill, New Delhi, 2013.
4. Walter Slavic, "Absolute Java", Pearson Education, New Delhi, 2013.

19E028 RELATIONAL DATABASE MANAGEMENT SYSTEMS

3 0 0 3

INTRODUCTION : Databases – Conventional file Processing – Data Modeling for a database – Three level architecture – Data Independence – Components of a Database Management System – characteristics - Advantages and disadvantages of a DBMS - Data base administrator-functions and responsibilities - Data Modeling: ER model: Entities, Attributes, relationships – Weak and strong entity types – Design of Entity Relationship data models, EER Model - Conversion of EER to Relational Model (9)

RELATIONAL MODEL : Relational data model basics - properties of Relations- Domains and Key concept – Enforcing data integrity constraints - Relational algebra operations. (9)

RELATIONAL DATABASE MANIPULATION : Introduction to Structured Query Language(SQL) – SQL commands for defining database – Manipulations on database – Basic data retrieval operations - aggregate function- order by/group by clause- sub queries-in-any-all-views in SQL. (9)

DATA BASE DESIGN THEORY : Functional dependencies - Normal forms – Normalization: 1NF to 5NF- Domain Key Normal Form – losses join and dependency preserving decomposition (9)

DATABASE TRANSACTION & SECURITY : Transaction processing – properties - Concurrency control mechanism - security and integrity threats - Defense Mechanism. (9)

Total L: 45

TEXT BOOKS:

1. Abraham, Siberschatz, Henry.F.Korth, Sudharshan.S, "Database System Concepts", Tata McGraw-Hill, New Delhi, 2014.
2. Ramez Elmasri, Shamkant Navethe, "Fundamentals of Database Systems", Pearson Education, New Delhi, 2011.

REFERENCES:

1. Sumathi.S, Essakirajan.S, "Fundamentals of Relational Database Management Systems", Springer, New Delhi, 2008.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Tata McGraw-Hill, New Delhi, 2014.
3. Thomas Connolly, Carolyn Begg, "Database system: A Practical Approach to Design, Implementation, and Management", Pearson Education, England, 2014.
4. Jeffrey A. Hoffer, Mary B Presscott, Fred R Mcfadden, "Modern database Management Systems", Pearson Education, Boston, 2007.

19E029 OPERATING SYSTEMS

3 0 0 3

INTRODUCTION : Operating system structure – Function – Evolutions of Operating Systems - Serial processing, Batch Processing, Multiprocessing, Time-sharing operating systems- Distributed OS - Multiprocessor OS– Real- time OS – Introduction to system calls- operating System Structures- Traditional UNIX structure – Structure of Mobile operating systems.(8)

PROCESS MANAGEMENT : Introduction to processes –Threads - Scheduling objectives - Scheduling Criteria - Types of scheduling algorithms – Performance comparison – Inter-process communications - Synchronization – Semaphores – Deadlock - Prevention, Recovery, Detection – Avoidance. (10)

MEMORY MANAGEMENT : Single contiguous allocation – Partitioned allocation – Paging – Virtual memory concepts – Swapping – Demand paging – Page replacement algorithms – Segmentation – Segmentation with paging. (9)

DEVICE AND FILE MANAGEMENT : Principles of I/O hardware – I/O software – Disks – Disk Scheduling Algorithms– File Systems – Files-Directories- File system implementation – Allocation methods – Security – Protection mechanisms. (9)

CASE STUDIES: : LINUX – History – Design Principles – Kernel modules – Process Management – Scheduling – Memory Management – File Systems – Input and Output . (5)

CASE STUDIES: : WINDOWS 7 Design Principles – System Components – File Systems Volume management and fault tolerance- Networking. (4)

Total L: 45

TEXT BOOKS:

1. Silberschatz A., Galvin P. B., Gagne G, "Operating System concepts Concepts", 9th Edition, Wiley India Pvt. Ltd, New Delhi, 2015.
2. Deitel H. M., Deitel P. J., Choffnes D. R, "An Introduction to Operating Systems", 3rd Edition, Pearson Education, New Delhi, 2013

REFERENCES:

1. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Pearson Education Inc, New Delhi, 2014.
2. Andrew S. Tanenbaum, Albert S. Woodhull, "Operating Systems: Design and Implementation", 3rd Edition, Pearson Education Inc., New Delhi, 2012.
3. Mukesh Singhal and Niranjana G. Shivaratis, "Advanced Concepts in Operating Systems", Tata McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2013.
4. Dhamdhare D. M, "Operating Systems: A Concept - based Approach", 3rd Edition, Tata McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2014.

19E030 NEURAL NETWORKS AND FUZZY SYSTEMS

3 0 0 3

INTRODUCTION TO NEURAL NETWORKS : Fundamentals Concepts, Basic Models, Important Terminologies, McCulloch - Pitts Neuron, Linear Separability, Hebb Network, Perceptron, Adaline, Madaline - Architecture, algorithm and Simple Applications (9)

NEURAL NETWORKS BASED ON PATTERN ASSOCIATION AND COMPETITION : Training Algorithms for Pattern Association - Hebb rule and Delta rule, Hetero-associative and Auto-associative Net, Bidirectional Associative Memory - Architecture, Algorithm and Simple Applications., Backpropagation - Architecture, Algorithm and Applications. Unsupervised Learning - Kohonen Self-Organising Maps, ART1 and ART2 and Counter Propagation (9)

FUZZY LOGIC : Introduction, Classical and Fuzzy Sets: Properties and Operations, Crisp and Fuzzy Relations - Cardinality, Properties and Operations, Composition, Tolerance and Equivalence Relations, Simple Problems. (9)

MEMBERSHIP FUNCTIONS : Features of membership function, Standard forms and Boundaries, fuzzification, membership value assignments, Fuzzy to Crisp Conversions, Lambda Cuts for fuzzy sets and relations, Defuzzification methods.(9)

APPLICATIONS OF NEURAL NETWORKS AND FUZZY LOGIC : Applications of Neural Networks: Pattern Recognition - Image compression – Communication - Control systems - Applications of Fuzzy Logic: Fuzzy Process Control - Fuzzy Optimization - Fuzzy Logic Controllers. (9)

Total L: 45

TEXT BOOKS:

1. Sivanandam S N, Sumathi S, Deepa S N, "Introduction to Fuzzy Logic using MATLAB", Springer-Verlag, Berlin Heidelberg, 2010.
2. Sivanandam S N, Sumathi S, Deepa S N, "Introduction to Neural Networks using MATLAB 6.0", Tata McGraw- Hill, New Delhi, 2014.

REFERENCES:

1. Laurene Fausett , "Fundamentals of Neural Networks", Pearson Education India, New Delhi, 2008.
2. Timothy Ross , "Fuzzy Logic with Engineering Applications", Mc Graw-Hill, Singapore, 2010.
3. Zimmermann H J , "Fuzzy Set Theory and its Applications", Allied Publisher, New Delhi, 2013.
4. Sivanandam S N, Deepa S N , "Principles of Soft Computing", Wiley India (P) Ltd, New Delhi, 2011.

19E031 LINUX ARCHITECTURE

3 0 0 3

INTRODUCTION : Evolution of Linux OS – Main characteristics of Linux – Typical Linux distributions – Linux directory structure – User and super/root users – Access rights – Home directory – Overview of shell and GUI. (9)

LINUX KERNAL ARCHITECTURE : Layer diagram of OS - Hardware Abstraction Layer (HAL) – Memory manager – Scheduler – File system – I/O subsystem – Networking subsystem – IPC – User space. (9)

LINUX FILE SYSTEM : Layers of Linux file system – Structure of inode – Process file system – System programming concepts – API & ABIs – C library and compiler (9)

DEVICE DRIVER : PC I/O architecture – Classification of Linux devices: character and block devices – Port I/O – PCI and ISA bus – Polling, interrupt, and waiting queue – Device Files - Device driver Registration – Device driver initialization – I/O operation - Typical Linux driver – Dynamic and static drivers (10)

SYSTEM START UP : System start up (Bootng) Methods - Kernel modules – Linking and unlinking of modules – On Demand modules linking. (8)

Total L: 45

TEXT BOOKS:

1. Michael beck, Harald bohme, Mirko dziadzka, Ulrich Kunitz, "Linux Kernel Programming", 3rd Edition, Pearson Education, Newdelhi, 2002.
2. Robert Love, "LINUX system programming", 3rd Edition, Publishers & Distributors Pvt. Ltd., New Delhi, 2007.

REFERENCES:

1. P.Raghavan, Amol Lad, Sriram Neelakandan, "Embedded Linux system design and development", Tailor & Francis Group, New Delhi, 2016.
2. Daniel P.Bovet, Marco Cesati, "Understanding the Linux kernel", Third, Shroff publishers & distributors Pvt Ltd., New Delhi, 2005.
3. M.Tim Jones, "GNU/Linux Application Programming", Wiley Dreamtech India Pvt. Ltd., New Delhi, 2005.
4. Jonathan Corbet, Alessandro Rubini, Greg Kroah-Hartman, "Linux Device Drivers", 3rd Edition, O'REILLY, USA, 2005.

19E032 TOTAL QUALITY MANAGEMENT

3 0 0 3

EVOLUTION OF QUALITY MANAGEMENT : History of quality, Definition of quality, Dimensions of quality, Quality Planning, Principles of TQM, Contributions of Quality Gurus: Deming – Juran – Crosby, Cost of Quality. (9)

TQM PRINCIPLES : Customer satisfaction, Service Quality, Customer feedback, Teams, Quality Circles, Continuous Process Improvement, Juran Trilogy, Kaizen, 5S. (9)

STANDARDS / MODELS / METHODOLOGY : ISO standards: overview – clauses - advantages, CMM, CMMi, PCMM: Structure - Process areas - Characteristics of maturity levels, Six Sigma: evolution – DMAIC – DFSS - Advantages / disadvantages of standards / models / methodology. (9)

MEASUREMENT, ANALYSIS AND IMPROVEMENT : QMS in Software Organization, Software Quality Assurance Plans, Product Quality and Process Quality, Software Measurement and Metrics, Inspections (9)

TQM TOOLS : Benchmarking – Reasons and Process, Quality function deployment, House of Quality, Seven QC tools, Control charts, Management tools (9)

Total L: 45

TEXT BOOKS:

1. Dale H.Besterfield, Carol Besterfield, Geln and Mary, "Total Quality Management", Pearson Education, New Delhi, 2003.
2. Nina S Godbole, "Software Quality Assurance: Principles and Practice", Narosa Publishers, New Delhi, 2007.

REFERENCES:

1. Logothetics, "Managing for Total Quality - From Deming to Taguchi and SPC", Prentice Hall, New Delhi, 2002.
2. Subburaj Ramasamy, "Total Quality Management", Tata McGraw-Hill, New Delhi, 2005.
3. Juran J.M, and Gryna F.M, "Quality Planning and Analysis - From Product Development Through Use", Tata McGraw Hill, New Delhi, 2001.
4. Deming W.E, "Out of the Crisis", MIT Press, Cambridge, MA, 2000.

ONE-CREDIT COURSES

19EF01 LV SWITCHGEARS

1 0 0 1

CONTACTORS : Introduction to LV Switchgear – Typical industrial electrical layout. Introduction to contactors – Difference between switch and contactor – Types of contactors – Utilization category – Selection of contactors –Name plate details – Limits of operation – Special types of contactors (3)

RELAYS AND FUSES : Introduction to overload relay – Types of overload relay – Types of motor failures – Utilization category and trip class – Selection of overload relay – Introduction to Fuses. HRC fuse – Types and Utilization category. Introduction to digital protection techniques (3)

SWITCHES AND STARTERS : Introduction to switch – Types of switches – Utilization category – Selection of switches.

Introduction to motor starters – Types of starters – Control and Power wiring circuits – Selection of starters – Types of timers (3)

CIRCUIT BREAKER : Introduction to circuit breaker – Types of circuit breaker – Selection of Air circuit breaker – Introduction to MCCB and MCB – Difference between relay and release (2)

HANDS ON TRAINING : Assembling and maintenance of contactors - Testing the pickup and drop off voltages in contactors - Testing of thermal overload relay - Control wiring practice on DOL and Star Delta Starter - Demo on various LV Switchgear products (4)

Total L: 15

REFERENCES:

1. Wadhwa C L, "Electrical Power Systems", New Age International, New Delhi, 2010.
2. Madhava Rao T S, "Power Systems Protection : Static Relay with Microprocessors Application", Tata McGraw- Hill, New Delhi, 2004.

19EF02 ENERGY AUDITING AND CONSERVATION TECHNIQUES

1 0 0 1

INTRODUCTION : Mandatory Auditing requirements – Audit purpose, scope and frequency - Energy Auditing & Conservation concepts and its Importance – Energy conservation opportunities in electrical power supply sector - The Energy Conservation Act, 2001 and its features (3)

ENERGY AUDIT METHODOLOGY AND MANAGEMENT SYSTEM : Overview of Electrical energy audit, tools for electrical energy audit- billing, tariff, demand, power factor and load factor. Duties and responsibilities of energy systems auditors (3)

ENERGY CONSERVATION IN ELECTRICAL SYSTEMS : Overview of Electrical energy requirements-pumps, fans, lighting and Variable Speed Drives. Electrical energy conservation- industrial motors, air conditioning and refrigeration systems (3)

ENERGY AUDITING IN INDUSTRIAL LIGHTING AND GREEN BUILDINGS : Choice of lighting, energy saving, control of lighting, lighting standards, lighting audit, use of different lighting technologies, electronic ballast. Overview of Green buildings (3)

DEMONSTRATION SESSIONS : Power factor Measurement & Compensation Techniques - Energy Saving Techniques - Lighting, air conditioning, pumps & fans - Case studies and exercises (3)

Total L: 15

REFERENCES:

1. Donald R Wulfinghoff, "Energy Efficiency Manual", Energy Institute Press, USA, 1999.
2. Tripathy S C, "Electrical Energy Utilization and Conservation", Tata McGraw-Hill, New Delhi, 1991.
3. Thiruvengadam S, Srinivasan P S, "Energy Management In Electrical Energy System", ISTE Publication, New Delhi, 1999.

19EF03 ELECTRICAL SAFETY STANDARDS AND PRACTICES

1 0 0 1

INTRODUCTION : Introduction and characteristics of conductors and insulators (1)

PRINCIPLES OF ELECTRIC SAFETY : Basic definition and principles of Electric Safety. Earth Effects when current passing through human body (2)

RULES & REGULATIONS : Electricity Acts, Rules & Regulations, Earthing Practices, Introduction to IEEE standards (2)

PROTECTION : Safety against Over voltages-Safety against Static Electricity-Protective Equipments (2)

STANDARDS : Electrical Standards – Indian Scenario (2)

SAFETY PRECAUTIONS : Indoor safety precautions in indoor equipments - Outdoor safety precautions (2)

CASE STUDY : Electrical Emergencies, Factors and study of Electrical Accidents - Case Study and remedial measures, Definition and study of Arc injuries (2)

ELECTRICAL SAFETY : Determining Safe Approach Distance - Determining Arc Hazard Category, Fire extinguishers for electrical safety (2)

Total L: 15

REFERENCES:

1. Kenneth G. Mastrullo, Ray A. Jones, "The Electrical Safety Program Book", Jones and Bartlett Publishers, London, 2003.
2. Palmer Hickman, "Electrical Safety-Related Work Practices", Jones & Bartlett Publishers, London, 2009. TANGEDCO.

19EF04 AUTOMOTIVE ELECTRICAL SYSTEMS

1 0 0 1

INTRODUCTION : Major components of an Automobile Systems and its functions - Overview of four stroke I.C.engine -Four Cylinder Engine – Spark firing sequence (2)

AUTOMOBILE ELECTRICAL AND ELECTRONIC SYSTEMS AND COMPONENTS : Block diagram of Automobile electrical system - Typical wiring diagram - Starter system: General layout - Basic starting circuit - Ignition system: Battery and magneto types - Battery ignition system for four cylinder engine - Ignition system circuit - Distributed ignition coil and ignition advance. Charging system: Typical alternator in common use - cut-out and regulator - Lighting & accessories system - Wiper motor – circuit diagram of wind screen wiper motor and washer (5)

SENSORS AND ACTUATORS : Physical Variables to be measured in automobiles: Position sensor: Magnetic reluctance and Hall effect sensor - Temperature sensor: Coolant temperature - Speed sensor – Fuel level sensor - Acceleration sensor - Actuator: Principle of solenoid and Fuel injector (4)

DIAGNOSTICS AND COMMUNICATION BUS : Block diagram of Engine control unit -Diagnostics procedure: Introduction – Diagnostics theory – On board and Off-board diagnostics – Diagnostics Link Connector – Vehicle condition monitoring - CAN bus - topology – Data transmission – CAN Protocol – Overview of CAN controller – LIN bus: overview – Data Transmission System – LIN protocol (4)

Total L: 15

REFERENCES:

1. Tom Denton, "Automobile Electrical and Electronics systems", Taylor & Francis, London, 2012.
2. KK Jain, RB Sharma, "Automobile engineering", Tata McGraw Hill, New Delhi, 2011.
3. William B. Ribbens, Norman P. Mansour, "Understanding of Automotive Electronics", Butterworth-Heinemann, United Kingdom, 2003.
4. Automotive Electrics/ Automotive Electronics, 5th Edition, Robert Bosch GmbH, 2004.

19EF05 CAD TOOLS FOR VLSI DESIGN AUTOMATION

1 0 0 1

INTRODUCTION TO VLSI DESIGN PROCESS : Design flow – Role of CAD tools in the design process (2)

DESIGN CAPTURE : Features of Mentor Graphics-Design Architect IC, a tool for schematic capture, netlisting, simulation setup and results viewing - Creating an Inverter using DA_IC- ELDO simulator (3)

SIMULATION : Features of Advance MS simulator, a tool for verification platform for AMS design and verification - Exercises (4)

PHYSICAL LAYOUT : Features of the IC Station Tool Suite for full custom IC design flow editing, Schematic-driven layout and top-level floor planning/routing – Exercises (3)

PHYSICAL VERIFICATION : Features of Calibre LVS for physical verification tool, for layout versus schematic – Exercises (3)

Total L: 15

REFERENCES:

1. Michael John Sebastian Smith, "Application-Specific Integrated Circuits", Addison-Wesley, New Delhi, 2010.
2. WayneWolf, "Modern VLSI Design: Systems on Chip Design", Pearson Education, New Delhi, 2007.

19EF06 DIGITAL DESIGN WITH VERILOG HDL

1 0 0 1

INTRODUCTION : Digital Design, Verification, and Hardware description languages (2)

VERILOG FOR DESIGN : Introduction to Logic Synthesis, Synthesizable Constructs -Inferring Combinational Circuit elements- Inferring Sequential Circuit elements -State Machines -Counters -Encoders/Decoders -Synthesis of Loops -Data Path - Design Partitioning / Methodology -Synthesizable Code-care about, Sensitivity list and Simulation Synthesis mismatch conditions (3)

VERILOG FOR VERIFICATION : Delay Modeling in Verilog on Briefly behavioral constructions, Fork-join, Events - Clock Generation -Data Generation, Deterministic, Random -Some Systems Tasks -TestBench Architecture (3)

DESIGN EXAMPLES : RISC Stored Program Machine -UART Design (3)

MINI PROJECT IMPLEMENTATION : Mini Projects Specification and Scope Discussions (2), REVIEW OF PROJECTS-Presentation by student groups (15 min per student group), Feedback on the Design Project(1) (4)

Total L: 15

REFERENCES:

1. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", Pearson Education, New Delhi, 2017.
2. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, Chennai, 2019.

19EF07 GRAPHICAL PROGRAMMING

1 0 0 1

INTRODUCTION TO GRAPHICAL PROGRAMMING : Graphical Programming vs Coventional Programming - Features of LabVIEW - Data Flow Programming - Customizing Virtual Instruments - (2)

MODULAR PRORAMMING : Sub-VI Creation - Debugging Techniques - Examples (2)

ARRAYS AND CLUSTERS : Concept of Polymorphism - Error Clusters (3)

LABVIEW STRUCTURES : For Loop - While Loop - Case Structures - Sequence Structures (5)

STRINGS AND FILE I/O : String Functions - File I/O Operations (3)

Total L: 15

REFERENCES:

1. Rick Bitter, Taqi muhiuddin, Matt Nowrocki, "LabVIEW Advanced Programming Techniques", 2nd Edition, CRC Press, USA, 2007.
2. Gary W. Johnson; Richard Jennings, "LabVIEW Graphical Programming", 4th Edition, McGraw-Hill, New Delhi, 2006.

19EF08 ADVANCED GRAPHICAL PROGRAMMING

1 0 0 1

DATA ACQUISITION : DAQ Architecture - DAQ Assistant - Measurement and Automation Explorer (2)

LOCAL AND GLOBAL VARIABLES (2)

REENTRANT VIRTUAL INSTRUMENTS (1)

OBJECT ORIENTED PROGRAMMING IN LABVIEW (3)

REMOTE DATA MANAGEMENT : Data Socket - LabVIEW Web Server - Viewing and Controlling Front Panels Remotely - Viewing and Controlling Front Panels in LabVIEW - Viewing and Controlling Front Panels from a Web Browser (3)

IMAGE ACQUISITION AND PROCESSING IN LABVIEW (2)

PROJECT MANAGEMENT IN LABVIEW (2)

Total L: 15

REFERENCES:

1. Rick Bitter, Taqi muhiuddin, Matt Nowrocki, "LabVIEW Advanced Programming Techniques", 2nd Edition, CRC Press, USA, 2007.
2. Gary W. Johnson; Richard Jennings, "LabVIEW Graphical Programming", 4th Edition, McGraw-Hil, New Delhi, 2006.

19EF09 LOW POWER MICROCONTROLLERS AND APPLICATIONS

1 0 0 1

ARCHITECUTRE OF MSP430 : CPU Core Features - Programmer's Model - Clock System Configuration – Getting started with CCS IDE (3)

ON-CHIP PERIPHERALS OF MSP430 : GPIO - Timers - Watchdog Timers - ADC - Serail Communication: I2C, SPI, UART (10)

LOW POWER MODES IN MSP430 : Developing Applications in Various Low Power Modes (2)

Total L: 15

REFERENCES:

1. John Davies, "MSP430 Microcontroller Basics", 1st Edition, Newnes, USA, 2008.
2. Chris Nagy, "Embedded System Design using the TI MSP430 Series", 1st Edition, Newnes, USA, 2003.

19EF10 CONTROLLER DESIGN AND SIMULATION USING DSPACE

1 0 0 1

SOFTWARE/ HARDWARE SETUP : Introduction to ControlDesk Next Generation- ControlDesk platform management- Introduction to Real-Time Interface I/O implementation with Real-Time Interface (5)

CONTROLDESK PROJECT AND EXPERIMENT MANAGEMENT : ControlDesk instrumentation - Introduction to Grid-Tied Inverter and Solar PV Grid Tied-Inverter (3)

CONTROLDESK BASIC DATA ACQUISITION : Basics on bus communication using ControlDesk - Multitasking and interrupt handling - Programming S-functions (3)

FEATURES OF DSPACE : Features of dSPACE prototyping systems and single-processor systems, and the use of dSPACE in applications like Solar PV GridTied Inverter (4)

Total L: 15

REFERENCES:

1. Jerry Ventre, Roger A. Messenger, "Photovoltaic System Engineering", CRC Press, 2014.

19EF11 SOLAR PV SYSTEMS DESIGN SIMULATION MONITORING AND CONTROL

1 0 0 1

INTRODUCTION TO PV SYSTEM DESIGN : Solar PV Fundamentals - PV Modules, PV Inverters, DC & AC Configurations, and Parameters & Datasheet Approach, MET Parameters, Weather Monitoring S, Modems & Protocols (2)

SOLAR PRO USER INTERFAC : Setting up of a Solar PV System using Simulation Wizard, 3D CAD Interface, File formats, Export / Import Capabilities, System Requirements, Shortcut keys. Choosing the Data Source - Meteorological Data, PV database, Inverter Database (2)

CONFIGURATION OF PV SYSTEM : Assessment of Loads to be Connected, Selection of Right Inverters & PV modules. Creating a String, Creating an Array, PV Array Configuration, PV Inverter Configuration, PV Electrical Assembly Configuration, PV Module Mounting Configuration & PV Module Tracking Configuration, Electrical BOM Preparation (4)

3D DESIGN FEATURES : Building and Surrounding Objects - Setting up of Building Parameters, Setting up of Surrounding Buildings or Structures, Setting up of Plants, Trees and Vegetation (2)

SIMULATION & REPORT GENERATION : Time Trackers, I-V curve simulation, Shadow analysis, Power generation, PV system cost & Financial analysis, PV Array layout, Power generation and loss diagram, Performance Ratio Analysis. Economic viability and Cost effectiveness of project, Print options and export options of variable parameters (2)

MONITORING OF SOLAR PV POWER PLANT : Remote Monitoring, Real – Time Monitoring, Multiple Inverter Monitoring, Interfacing of Hardware- Solar Link Zero- Modem, Routers, Modbus – Internet Gateway, Cloud Data, RS-485, RS-232 Serial, USB, Ethernet and DVI-D ports (3)

Total L: 15

REFERENCES:

1. Roger A. Messenger, Jerry Ventre, "Photovoltaic System Engineering", CRC Press, USA, 2004.

19EF12 POWER ELECTRONICS IN MORE-ELECTRIC AIRCRAFT

1 0 0 1

INTRODUCTION TO AIRCRAFT ELECTRICAL SYSTEM : Power sources: Aircraft Batteries – Lead Acid Batteries, VRLA Batteries, NiCd Batteries, Generators, Main Engine, Auxiliary Power Unit; Primary and Secondary Power Distribution System (3)

MORE ELECTRIC AIRCRAFT ARCHITECTURE : Migration from conventional fixed frequency electrical system to variable frequency electrical system, Advantages of More Electric Aircraft. Introduction to working principle of various Electrical Loads in Conventional and More Electric Aircraft. Electrical Loads in conventional aircraft – Avionics, Cabin Lighting, In-Flight Entertainment, Pumps and Fans. New Electrical Loads in More Electric Aircraft – Cabin Pressurisation Compressor, Air Conditioning, Ice Protection, Flight Control Actuator, Landing Gear, Electrical Taxi System, Braking System, Fuel Pumping (4)

RECTIFIERS, INVERTERS AND MOTOR CONTROLLERS IN AIRCRAFT : Starter Generator System in Aircraft: Main Engine and APU start System. Multipulse Rectifiers – Autotransformer Rectifier Units as front end converter. How design of Inverters for motor controllers in Aircraft is different from that for conventional industrial application. 2- Level and 3-Level inverters for motor control – Brushless DC motor control and Sensorless Vector control (4)

CASE STUDIES & PROJECT : Introduction to DO-160 standard and how that influences the design of power converter in aircraft. Practical Design of Power Electronic converters for real life Aero application: Case Study: Design of Exciter Power

Supply – Design for space and weight optimization while meeting DO-160 standard (4)

Total L: 15

REFERENCES:

1. E.H.J. Pallett, "Aircraft Electrical Systems", 3rd Edition, Pearson, 1997.
2. Thomas Eismen, "Aircraft Electricity and Electronics", 6th Edition, McGraw-Hill Education, 2013.
3. Ramesh K. Agarwal, "Recent Advances in Aircraft Technology", Intechopen, 2012.

19EF13 FIELD PROGRAMMABLE ANALOG ARRAY FOR ANALOG SYSTEM DESIGN

1 0 0 1

INTRODUCTION : Overview of Analog Design - Introduction to FPAA and its advantages - Role of EDA tool in Analog Design process (1)

CONFIGURABLE ANALOG MODULES : Introduction to Anadigm's inbuilt Analog Functions (CAM) - Generation of Clock Signals - Signal Delay - Performance of CAM. (1)

SIMULATION : Features of ANADIGMDESIGNER2 EDA tool for simulating the analog design. (1)

FPAA IO INTERFACING : Interfacing of input and output signals to the FPAA - Rauch Filter - Output Buffer (1)

PHYSICAL REALIZATION : Configuring the FPAA with analog design - Real time verification. (3)

STATIC CONFIGURATION : Full Wave Rectifier - Tone Generation and Notch filter - Voltage Controlled Oscillator - Pulse Width Modulation - Phase Detector. (2)

DYNAMIC RECONFIGURATION : Reconfigurable Analog design using FPAA, Various methods of Reconfiguration - Real time verification - Programming the PIC controller. (3)

MINI PROJECTS : Specification and Scope Discussions (3)

Total L: 15

REFERENCES:

1. Thomas L. Floyd, "Instructor's Resource Manual to Accompany Electronic Design", 8th Edition, Pearson Education Ltd, New Delhi, 2008.
2. Thomas L. Floyd, "Electronic devices Conventional Current Version", 9th Edition, Pearson Education Ltd, New Delhi, 2014.

19EF14 SYSTEMS ENGINEERING FOR AUTOMOTIVE APPLICATIONS

1 0 0 1

INTRODUCTION : Systems, Systems Engineering and System on Systems Design Models flow: Waterfall, Spiral and INCOSEVEE model Product development flow Values of Systems Engineering (3)

ROLES OF SYSTEM ENGINEER : Understanding the Systems Engineering goal, Significance of documentation, Knowing about DSM (Design structure matrix), Interdisciplinary role of Systems Engineering, Behavioral aspects of Systems Engineering (3)

PROCESS : Requirements process, Baseline creation (1)

INNOVATION IN SYSTEM ENGINEERING : Creativity characteristics, About TRIZ, Ideality, Contradictions and approach to resolve Innovation in Technical systems: Architectural Innovation (3)

DESIGN PROCESS : Definitions, Axioms, Design Matrices, Types and examples, Constraints (2)

SYSTEM RELIABILITY : Definition, Approach to achieve system reliability, significance of Reuse, Failure Mode Effects Analysis (FEMA) (2)

EXAMPLE SYSTEM DESIGN : Designing an Automotive ECU (1)

Total L: 15

REFERENCES:

1. INCOSE Systems Engineering Handbook , "A Guide for System Life Cycle Processes and Activities", 4th Edition, Wiley, New Jersey, 2015.

2. Alexander Kossiakoff, William N. Sweet, Samuel J. Seymour, Steven M. Biemer, "Systems Engineering Principles and Practice", 2nd Edition, Wiley, New Jersey, 2011.
3. Benjamin S. Blanchard, John E. Blyler, "System Engineering Management", 5th Edition, Wiley, New Jersey, 2016.

19EF15 ELECTRICAL VEHICLES

1 0 0 1

INTRODUCTION TO ELECTRIC VEHICLES : Social and environmental importance of electric vehicles. – Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance. (3)

HYBRID ELECTRIC VEHICLES : History of Hybrid Electric Vehicles - Energy consumption Concept of Hybrid Electric Drive - Architecture: Series Hybrid Electric Drive, Parallel hybrid electric drive. - Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super Capacitors. (3)

ELECTRIC PROPULSION UNIT : Electric components, Configuration and control of drives - DC Motor - Induction Motor - Permanent Magnet Motor - Switch Reluctance Motor - Drive system efficiency - Energy storage for EV and HEV - Energy storage requirements, Battery parameters, Modelling of Battery. (5)

POWER ELECTRONIC CONVERTERS : Power Electronic Converter for Battery Charging - Charging methods for battery - Design of Z-converter for battery charging. - Case Study: Design of a Battery Electric Vehicle (BEV). (4)

Total L: 15

REFERENCES:

1. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, London, 2009.
2. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd Edition, CRC Press, London, 2010.
3. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer, London, 2013.
4. C.C. Chan and K.T. Chau, "Modern Electric Vehicle Technology", OXFORD University Press, New York, 2001.
5. Chris Mi, M. Abul Masrur, David Wenzhong Gao, "Hybrid Electric Vehicles Principles And Applications With Practical Perspectives", Wiley Publication, UK, 2011.
6. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, UK, 2003.

19EF16 PHASOR MEASUREMENT UNITS AND APPLICATIONS

1 0 0 1

INTRODUCTION : Phasor Measurement Units (PMUs), Global Positioning System (GPS), Functional requirements of PMUs and Phasor Data Concentrators (PDCs), Phasor estimation of nominal frequency inputs. (2)

TRANSIENT RESPONSE : Transient response of Instrument Transformers, Transient response of Filters, Transient response during Electromagnetic and Power Swings, Impact of Transient Response of Phasor Measurements. (2)

APPLICATIONS OF PHASOR MEASUREMENT UNITS : Phasor Measurements Unit based Adaptive Protection of Transmission Lines, Out-of-Step protection, Adaptive System Restoration, Phasor Measurement units in Large Scale Integration of Wind and Solar Energy systems, Introduction to Wide Area Monitoring, Protection and Control (WAMPAC). Deployment of large scale PMUs in Utilities, Globally and in Indian Power sector. (8)

STANDARDS : Synchrophasor Standards - IEEE C37.118.1-2011, IEEE C37.118a-2014, IEC 61850 & IEEE C37.118, Evaluation / Validation of PMU-Total Vector Error (TVE) both Steady State and Dynamic/Transient conditions. IEEE C37.118.2-2011. (3)

Total L: 15

REFERENCES:

1. A.G.Phadke, J.S. Thorp, "Synchronized Phasor Measurements and Their Applications", 2nd Edition, Springer Publications, New York, 2017.
2. IEEE Standards, "IEEE Synchrophasor Test Suite Specification", Version 2, IEEE Publishing, USA, 2015.
3. IEEE Standards, "IEEE C37.118.1a-2014, IEEE Standard for Synchrophasor Measurements for Power Systems", IEEE Publishing, USA, 2014.
4. IEEE Standards, "IEEE C37.242, 2013 - Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMU) for Power System Protection and Control", IEEE Publishing, USA, 2013.
5. IEEE Standards, "IEEE C37.244, 2013 - Guide for Phasor Data Concentrator (PDC) Requirements for Power System Protection, Control, and Monitoring.", IEEE Publishing, USA, 2013.
6. IEEE Standards, "IEEE C37.118-2, 2011 - Standard for Synchrophasor Data Transfer for Power Systems", IEEE Publishing, USA, 2011.

19EF17 INDUSTRIAL DRIVES FOR AUTOMATION

1 0 0 1

INTRODUCTION : Construction and Principle of operation of PMSM and SynRM – AC drive Hardware Blocks – Control Blocks – Automatic Motor Adaptation – Parameterization of Drives (Local and Remote) (4)

CONFIGURATIONS OF DIFFERENT I/O CONTROL : Digital Input and output – Analog Input and output Control-word access – Motion control - Sequential Logic Control (SLC) - Parameterization for different communication protocol: RS 485 – MODBUS - PROFIBUS (3)

CONFIGURATION FOR DIFFERENT APPLICATIONS : AQUA – HVAC – Automation – Master/ Slave control (4)

PRACTICAL : Performance characterization of PMSM and SynRM - Conveyor control – Cascaded Pump Control – Synchronization of Drives with Master Slave Control (4)

Total L: 15

REFERENCES:

1. W. Bolton, "Programmable logic controllers", Elsevier Ltd, 2015.
2. Gordon Clarke, Deon Reyneders, Edwin Wright, "Practical Modern SCADA Protocols: DNP3, 60870.5 and Related systems", Newnes Publishing, 2004.

19EF18 DATA SCIENCE AND ANALYTICS FOR ELECTRICAL ENGINEERS

1 0 0 1

INTRODUCTION TO DATA AND MACHINE LEARNING (DATA SCIENCE) : Data Warehouse / business Intelligence- Big Data-Machine Learning-Deep Learning-How these technologies evolved and interconnected (2)

REVIEW OF BASIC ANALYTICS METHODS USING R : Phase 1: Discovery-Phase 2: Data Preparation-Phase 3: Model Planning-Phase 4: Model Building-Phase 5: Communicate Results / Visualization-Phase 6: Operationalize / Optimize model – Demo-Lab Assignment. (6)

INTRODUCTION TO ADVANCED ANALYTICS - THEORY AND METHODS : Unsupervised Learning-K-means Clustering-Association Rules-Regression Analysis-Linear-Logistics- Supervised Learning- Naive Bayesian Classifier- Decision Trees-Time Series Analysis-Text Analysis. (6)

USE CASES OF BIG DATA AND MACHINE LEARNING FOR ELECTRICAL ENGINEERS : Smart Meters & Smart Grid (1)

Total L: 15

REFERENCES:

1. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Edition, PHI learning Pvt. Ltd, New Delhi, 2015.
2. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", 1st Edition, Packt Publishing Ltd, Mumbai, 2013.

19EF19 ELECTRICAL POWER ON-BOARD WAR VESSELS AND AIRCRAFT

1 0 0 1

AC AND DC ELECTRICAL POWER GENERATION AND DISTRIBUTION (PGD) ON BOARD FIGHTER AIRCRAFT : Purpose and tasks – Power Supply requirements – Units of Installation, general layout and Functioning – Principle of Operation and Functional Block Diagram – Interconnectivity with other Systems – Operational Limitations – Serviceability Checks. (5)

AC AND DC ELECTRICAL POWER GENERATION AND DISTRIBUTION ON BOARD A MILITARY HELICOPTER : Types of Supplies –Specifications – Protection and Control Units – Onboard and external AC and DC Power supply system Description with Diagrams. (3)

PGD ONBOARD WARSHIPS : Types of electricalsupplies and power generation – Distributing systems – Design considerations for various classes and sizes of ships – Comparison of AC and DC ships – Challenges and special considerations in design of PGDfor warships. (5)

PGD ONBOARD SUBMARINES : Types of supplies, sources of power and distribution systems – Issues related to design for various classes and sizes of Submarines – Challenges in design of PGD for Submarines. (2)

Total L: 15

REFERENCES:

1. Raunek Kantharia, "A Guide to Ship's Electro-Technology, Part I, For Marine Engineers and Electrical Officers", Marine Insight Publishers, Kochi, 2013.
2. Mukund R. Patel, "Shipboard Electrical Power Systems", 1st Edition, CRC Press, United States, 2017.
3. Indian Navy, "OEM Supplied Technical Manuals of Ships, Aircraft and Submarines of Navy", Kochi, 2008.

19EF20 AEROSPACE AVIONICS

1 0 0 1

FLIGHT CONCEPT : Theory of Flight and Control Surfaces - Evolution of Avionics - Aircraft Cockpit Systems - Tactical Systems - Aircraft Power Plant Systems and Armament Systems on board an aircraft - Space avionics - Challenges in the design of Avionics for Space Vehicles. (3)

AIR NAVIGATION SYSTEMS : Electrical Navigation Systems - Compass-Inertial Navigation Systems (INS). (2)

AIRCRAFT FLIGHT INSTRUMENTS : Air Data Systems/ Air Data Computers - Pitot Static Systems - Air Speed Indicator - Vertical Speed Indicator - Altimeters-Artificial Horizon or Attitude Indicator - Flight Directors. (5)

CRITICAL AIRCRAFT AVIONICS SYSTEMS : Automatic Flight Control Systems -Automatic Flight Guidance Systems- Autopilot-Collision Avoidance Systems-Flight Data Recorders-Cockpit Voice Recorders. (5)

Total L: 15

REFERENCES:

1. E H J Pallett, "Aircraft Instruments", 2nd Edition, Pearson Education, New Delhi, 2009.
2. S. Nagabhushana, N. Prabhu, "Principles of Modern Avionics", 1st Edition, IK International Publishing House Pvt Ltd, New Delhi, 2018.
3. Cary Spitzer, Uma Ferrel, Thomas Ferrell, "Digital Avionics Handbook", 3rd Edition, CRC Press, Taylor & Francis Group, UK, 2017.
4. Ian Moir, Allan Seabridge, "Military Avionics Systems", 3rd Edition, Wiley & sons, India, 2006.

19EF21 1-D MODEL BASED SYSTEM DESIGN FOR CONTROL SYSTEM APPLICATIONS

1 0 0 1

INTRODUCTION TO ALTAIR ACTIVATE : Basic Network Theorems verification -Op-amp circuit - Realizing RLC circuits in Signal based /State space and Physical Based modeling. (5)

HYBRID SIMULATION : continuous and discrete blocks - Co-simulation - with Multi-body dynamics with Activate software - Co-simulation of Electromagnetic Devices - System Simulation- Custom Block creation - Model Exchange and Co-simulation with Functional Mock-up Interface - Application Case study using Altair Activate Software. (5)

INTRODUCTION TO ALTAIR EMBED : Simulation Environment - Building blocks and software features --- SIL/MIL - PIL- HIL - Application development on launchpad - GPIO – ADC -PWM - SPI/I2C Introduction to Motor Control and using BOOSTXL DRV8301, F28069M Launch pad. (5)

Total L: 15

19EF22 PRINTED CIRCUIT BOARD DESIGN AND ITS FABRICATION

1 0 0 1

PCB DESIGN PROCESS AN OVERVIEW : Conception Level Introduction: Specifying Parts- Packages and Pin Names- The Partlist- The Netlist- Parts- Routing- Adding Text- Plot and Drill Files- PCB Layout- Layer List and Selection Mask- Panning and Zooming-Projects-PCB Elements (2)

PCB DESIGN WORK FLOW : Board Outline; Parts – Anatomy of a Part- Part list- Editing Parts- Reference Designator- Mounting Holes- Nets- Ratlines and Routing- Nets – Netlist -Ratlines-Vias- Modifying Traces- Swapping Pins- Importing Netlist- Copper Areas- Text; Solder Mask Cutouts- Groups- Design Rule Checking- Exporting Drill and Gerber Files- Drills- Footprints and Libraries Adding and Editing Pins- Polylines. (3)

APPLICATION ORIENTED DESIGN AND FABRICATION : Creating the Project - Drawing the Board Outline - Adding Mounting Holes-Placing Parts- Adding Parts and Editing Nets- Power plane- Ratlines and Routings- Fabrication , Checking Design Rules, Generating Gerber and Drill Files, Fabrication Process and Methodology. (1)

INTRODUCTION TO PCB DESIGN SOFTWARE : Learn about design preparation- Import logic design data- Learn about design rule- Component placement- Interactively route nets- Run the automatic router- Learn about the manufacturing output and documentation. (5)

HIGH SPEED DESIGN : Design Concept – Layout techniques – DDR Routing – Signal Integrity – Power Integrity – PCB Simulation concepts - Design Problems – Case Studies (4)

Total L: 15

REFERENCES:

1. IPC Standards, "SM750 Component Packaging and Inter connecting with emphasis on Surface Mounting", IPC Standards, United States, 1988.
2. IPC Standards, "7351 B Generic Requirements for surface mount design And land pattern standard", IPC Standards, United States, 2010.
3. IPC Standards, "2221A Generic Standard on Printed Board Design", IPC Standards, United States, 2003.
4. James C. Blankenhorn , "SMT High Density Design and DFM", SMT Plus, United States, 1996.

19EF23 DIGITAL SYSTEM DESIGN AND VERIFICATION USING SYSTEM VERILOG

1 0 0 1

INTRODUCTION : : Digital Design and Verification, and Hardware description/verification language (HDL/HVL). (1)

SYSTEM VERILOG BASICS : : Verification Guidelines, Data types, Procedural Statements and Routines, Connecting testbench and design (4)

OOPS AND RANDOMIZATION : : Basic OOP (Object Oriented Programming), Randomization, Threads and IPC (Inter-Process Communication), Introduction to Advanced OOP and guidelines. (4)

TESTBENCH EXAMPLES : : Test Bench for ATM switch (3)

MINI PROJECT IMPLEMENTATION : Mini Projects Specification and Scope Discussions, REVIEW OF PROJECTS- Presentation by student groups (15 min per student group), Feedback on the Design Project (3)

Total L: 15

REFERENCES:

1. Chris Spear, Greg Tumbush, "System Verilog for Verification – A guide to Learning the Test bench Language Features", 3rd Edition, Springer, New York, 2012.
2. J.Bhasker, "A system Verilog Primer", BS publications, Hyderabad, 2016.

19EF24 METROLOGY FOR ELECTRICAL ENGINEERS

1 0 0 1

BASIC METROLOGY : Understanding metrology Vocabulary, Measurement significance and application - Common metrology terminologies. Calibration – Objective and benefits of calibration (2)

TRACEABILITY AND SI UNITS : Traceability and its importance - International Metrology Structure, Calibration Hierarchy, Importance of SI Units and types of SI Units (2)

STANDARDS USED IN ELECTRICAL CALIBRATION : Absolute, Primary, secondary, working and census standards, measurement setup - Interpretation of specifications of various calibration standards and Device Under Calibration (DUCs) - Metrology standardization documents (3)

CALIBRATION PROCEDURES FOR VARIOUS ELECTRICAL T & M INSTRUMENTS : Methods of Calibration - Calibration procedure of Voltmeter, Multimeter - Calibration procedure of DMM, Oscilloscopes, clamp meter, Panelmeters - Case studies (4)

MEASUREMENT UNCERTAINTY : Overview on Uncertainty – reason for uncertainty - its importance - Type A and type B uncertainty - Sensitivity coefficients – uncertainty evaluation - best practice - Uncertainty in practice & Case studies (4)

Total L: 15

REFERENCES:

1. Mike Cable, "Calibration: A Technicians Guide", ISA Publisher, 2005. International Organization for Standardization, Geneva, Switzerland, 1993, NABL.

19EF25 EMBEDDED LINUX

1 0 0 1

INTRODUCTION : Evolution of Linux OS – Typical Linux distributions – Linux directory structure – User and super/root users – access rights – Home directory – Overview of shell -Core Embedded Linux concepts- Including Board Support Package (BSP) - Software Development Kit (SDK) (3)

EMBEDDED LINUX ARCHITECTURE : Layer diagram of OS - Hardware Abstraction Layer (HAL) - Memory manager – scheduler – file system – I/O subsystem – Networking subsystem -Block diagram of Embedded Linux system - Cross compilation tool chain – Boot loaders - Linux kernel - Device trees - Board support package (BSP) (5)

EMBEDDED LINUX DEVELOPMENT ENVIRONMENT : Development environment through SDK - Deploy Linux to embedded system through a BSP - Build / deploy and debug software in cross-environment - Host vs target - Serial line communication program - Transferring files to target using NFS. (3)

EMBEDDED LINUX BUILD SYSTEM : Introduction - Linux Root file system - Yocto build system - Cross compilation of user space packages - Basic System and Application Programming: Time Storm eclipse - Debugging – profiling - target (inside QEMU). (4)

Total L: 15

REFERENCES:

1. Jon Masters, Karim Yaghmour, Philippe Gerum, Gilad Ben-Yossef, "Building Embedded Linux Systems", O'Reilly Media, Inc, USA, 2008.
2. Christopher Hallinan, "Embedded Linux Primer: A Practical, Real-World Approach", 2nd Edition, Prentice Hall, Boston, 2011.
3. Daiane Angolini, Otavio Salvador, "Embedded Linux Development using Yocto Projects", Packt Publishing, USA, 2017.
4. Marco Cesati, Daniel P. Bovet, "Understanding the Linux Kernel", O'Reilly Media, USA, 2000.
5. DougAbbott, "Embedded Linux Development Using Eclipse", Newnes, UK, 2008.
6. Alex Gonzalez, "Embedded Linux Development Using Yocto Project Cookbook", 2nd Edition, O'Reilly Media, USA, 2018.

19EF26 INTERNET OF THINGS USING CC3200

1 0 0 1

INTRODUCTION TO INTERNET OF THINGS (IOT) : Basic Terminologies - Architecture of a typical IoT System – Examples - Challenges in the design process of IoT – Overview ARM Cortex M4 Architecture Core -Getting started with Code Composer Studio (3)

FEATURES OF CC3200 WI-FI PROCESSOR : Programmer's Model of CC3200 Simplelink Wi-Fi Processor - Low Power Modes of CC3200 - Embedded Software Development Process – Features of TI RTOS - Configuration of TI RTOS for CC3200 Simplelink, Simplelink Wi-Fi Certification (2)

WIRELESS LOCAL AREA NETWORK : Basics of WLAN - WLAN Standards – WLAN Devices: Access Point, Station - WLAN Network Establishment (2)

SOFTWARE DEVELOPMENT TOOLS FOR PROGRAMMING CC3200 : Getting started with Code Composer Studio - Configuration with Pin-Mux Tools - Debugging with Uniflash Tools - HTML Page Download (2)

PROGRAMMING CC3200 : Features of CC3200 On-chip Peripherals – General Purpose I/O Programming in CC3200 – Interfacing a sensor with CC3200 using On-chip ADC – Interrupt Structure of CC3200 – Serial Communication in CC3200 – Overview of Client-Server Model – MQTT Protocol – Cloud Computing Overview – Simple IoT Applications using CCS Software (6)

Total L: 15

REFERENCES:

1. Jonathan W Valvano, "Introduction to Arm(r) Cortex-M Microcontrollers", 5th Edition, Create Space Independent Publishing Platform, US, 2012.
2. Andrew Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide", 1st Edition, Morgan Kaufmann, US, 2004.

LANGUAGE ELECTIVES

19G001 COMMUNICATION SKILLS FOR ENGINEERS

0 0 4 2

COMMUNICATION CONCEPTS :

Process of Communication
Inter and Intrapersonal Communication
Inter and Intrapersonal Communication Activities (9)

FOCUS ON SOFT SKILLS :

Etiquette — Work Place etiquette — Telephone etiquette
Body Language
Persuasive Communication
Public Speaking
Critical Reasoning and Conflict Management based on Case Studies
Group Communication
Meetings
Interview Techniques (14)

TECHNICAL WRITING :

Technical Writing Principles
Style and Mechanics
Technical Definitions – Physical, Functional and Process Descriptions
Technical Report Writing

Preparing Instructions and Manuals
Interpretation of Technical Data (15)

BUSINESS CORRESPONDENCE :

Writing Emails
Preparing Resumes
Memos
Technical and Business Proposals (7)

TECHNICAL COMMUNICATION :

Seminars
Process Description and Group Discussions
Use of Visual Aids (15)

Total P: 60

TEXT BOOKS:

1. Faculty Incharge, "Course Material on Communication Skills for Engineers", PSG College of Technology, Coimbatore, 2019

REFERENCES:

1. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, New Delhi, 2013
2. Jean Naterop B and Rod Revell, "Telephoning in English", Cambridge University Press, Cambridge, 2011
3. David A Mc Murrey and Joanne Buckley, "Handbook for Technical Writing", Cengage Learning, New Delhi, 2011
4. Simon Sweeney, "English for Business Communication", Cambridge University Press, New Delhi, 2012

19G002 GERMAN- LEVEL A1.1

0 0 4 2

GUTEN TAG! :

1. To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages
2. Vocabulary: related to the topic
3. Grammar: W — Questions, Verbs & Personal pronouns I. (10)

FREUNDE, KOLLEGEN UND ICH :

1. To speak about hobbies, jobs, learn numbers from 20; build dialogues and frame simple questions & answers
2. Vocabulary: related to the topic
3. Grammar: Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural (10)

IN DER STADT :

1. To know places, buildings, question, know transport systems, understand international words; build dialogues and write short sentences
2. Vocabulary: related to the topic
3. Grammar: Definite & indefinite articles, Negotiation, Imperative with Sien verbs (12)

GUTEN APPETIT! :

1. To speak about food, shop, converse; Vocabulary: related to the topic; build dialogues and write short sentences
2. Grammar: Sentence position, Accusative, Accusative with verbs, personal pronouns & prepositions, Past tense of haben & sein verbs (13)

TAG FÜR TAG/ZEIT MIT FREUNDEN :

1. To learn time related expressions, speak about family, about birthdays, understand & write invitations, converse in the restaurant; ask excuse, fix appointments on phone
2. Vocabulary: related to the topic
3. Grammar: Time related prepositions, Possessive articles, Modalverbs (15)

Total P: 60

TEXT BOOKS:

1. Dengler Stefanie, "Netzwerk A1.1", Klett-Langenscheidt GmbH., München, 2013
2. Sandra Evans, Angela Pude, "Menschen A1", Hueber Verlag, Germany, 2012

REFERENCES:

1. Stefanie Dengler, "Netzwerk A1", Klett-Langenscheidt GmbH, München, 2013
2. Hermann Funk, Christina Kuhn, "Studio d A1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2009
3. Rosa-Maria Dallapiazza, "Tangram Aktuell 1 (Deutsch als Fremdsprache)", Max Hueber Verlag., Munchen, 2004
4. Christiane Lemcke und Lutz Rohmann, "Grammatik Intensivtrainer A 1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2012

19G003 FRENCH LANGUAGE LEVEL 1

0 0 4 2

PARTS OF SPEECH :

1. inviter et répondre à une invitation, Pronoms sujets
2. L'article définis, l'article indéfinis
3. Conjugation : présent, adjectifs possessifs
4. interrogation, décrire les personnes
5. La vie de quatre parisiens de professions différentes (12)

ELEMENTS OF GRAMMAR :

1. Exprimer l'ordre et l'obligation demander et commander
2. l'adjectif possessifs, l'article partitif, l'article démonstratif, négation ne
3. pas, l'article contracté
4. verbe pronominaux
5. prepositions (12)

SENTENCE STRUCTURE :

1. Raconter et reporter-donner son avis
2. Futur simple, pronom complètement d'objet direct, passé composé
3. plusieurs région de France, imparfait, pronom y/en, imparfait (12)

TENSES AND NUMBERS :

1. Demander l'autorisation-passé récent, futur proche
2. La vie administrative et régionale, Pluriel des noms, moyens de transport (12)

DISCOURSE :

1. le discours rapporté, décrire un lieu, exprimer ses préférences
2. décrire la carrière, discuter d'un système éducation de France
3. parler de la technologie de l'information (12)

Total P: 60

TEXT BOOKS:

1. Christine Andant étal, "À propos (livre de l'élève", LANGER., New Delhi, 2012
2. Myrna Bell Rochester, "Easy French Step By Step", McGraw Hill Companies., USA, 2008

REFERENCES:

1. Michael D. Oates, "Entre Amis: An Interactive Approach", 5th Edition, Houghton Mifflin, 2005.
2. Bette Hirsch, Chantal Thompson, "Moments Literaries : An Anthology for intermediate French",
3. Simone Renaud, Dominique van Hooff, "En bonne forme".

19G004 BASIC JAPANESE

0 0 4 2

JAPANESE PEOPLE AND CULTURE :

1. Basic greetings and responses
2. Basic script — Method of writing hiragana and katakana — Combination sounds and simple words
3. Self introductions: "Hajimemashite" -Demonstratives "Kore", "Sore", "Are" — Demonstrative "Kono", "Sono", "Ano"
4. Possessive noun particle "no" — Japanese apartments: Greeting your neighbor (12)

PARTICLE "NI (AT)" FOR TIME :

1. kara (from) ~ made(until) — Particle "to (and)"
2. Time periods: Days of the week, months, time of day —Verbs (Present / future and past tense)
3. Telephone enquiry: Asking for a phone no. And business hours- Destination particle "e". (12)

LIKES AND DISLIKES :

1. Potential verbs (wakarimasu and dekimasu) — "Kara (~ because)"
2. Adverbs — Asking some one out over the phone-Verbs denoting presence
3. Introduction to Adjectives (na and ii type) -Verb groups — I, II and III — Exercises to group verbs- Please do (te kudasai)
4. Present continuous tenses (te imasu) — Shall I? (~ mashou ka) — Describing a natural phenomenon (It is raining) (12)

DIFFERENT USAGES OF ADJECTIVES :

1. Comparison — Likes and dislikes — Going to a trip- Need and desire (ga hoshii) — Wanting to ... (Tabeti desu)- Going for a certain purpose (mi -ni ikimasu)
2. Choosing from a menu-Adjectives ("i" and "na" type) — Adjectives (Positive and negative useage) (12)

ROLE PLAYS IN JAPANESE :

1. Framing simple questions & answers
2. Writing Short paragraphs & Dialogues
3. A demonstration on usage of chopsticks and Japanese tea party

(12)

Total P: 60

TEXT BOOKS:

1. Minna no Nihongo, Honsatsu Roma, "ji ban (Main Textbook Romanized Version)", International publisher — 3A Corporation, Tokyo, 2012

REFERENCES:

1. Eri Banno et.al, "Genki I: An Integrated Course in Elementary Japanese I -Workbook", 1999
2. Tae Kim, "A Guide to Japanese Grammar: A Japanese Approach to Learning Japanese Grammar", 2014
3. Minna No Nihongo, "Translation & Grammatical Notes In English Elementary".

ENGLISH

19GF01 INTERPERSONAL AND ORGANIZATIONAL COMMUNICATION

1 0 0 1

INTRA ORGANIZATIONAL COMMUNICATION : Communication Networks in an Organization; Intra- organizational communication (2)

INTER ORGANIZATIONAL COMMUNICATION : Flow Nomenclature; Workplace diversity and intercultural aspects of communication (2)

COMMUNICATION FUNCTIONS IN ORGANIZATIONS : Teamwork and team dynamics; Conflict resolution strategies and styles; Leading and influencing others-facilitation skills (3)

WRITTEN COMMUNICATION : Email Writing, Professional Reports, and Memos (4)

INTERPERSONAL SKILLS : Nature and Dimensions of Interpersonal Communication; Personality and Communication styles; Active listening and intentional responding; Working with emotional intelligence (4)

Total L: 15

REFERENCES:

1. Bagchi Subroto, "The Professional", Penguin Publications, UK, 2011.
2. PMBOK guide, "A Guide to the Project Management Body of Knowledge", Project Management Institute Inc, USA, 2013.

19GF02 HUMAN VALUES THROUGH LITERATURE

1 0 0 1

PROSE : Kalam's vision of college education in Wings of fire - Emerson's advocacy of independence of Human will in Self-reliance - Harmony in Education-views of Betrand Russel (4)

POETRY : Maintaining Human relations in Robert Frost's Mending Wall - Quest for identity and freedom in Kamala Das's An Introduction (2)

DRAMA : Statesmanship and friendship in Girish Karnad's Tughlaq (3)

ONE-ACT PLAY : The theme of love in Chekhov's The Bear (3)

SHORT STORY : Empathy in Somerset maugham's Mr. Know-all - Family bond in Anita Desai's Devoted son (3)

Total L: 15

TEXT BOOKS:

1. Faculty - Department of English, "Course materials", PSG College of Technology, Coimbatore, 2019.

REFERENCES:

1. Abrams M .H, Harpham, "A Glossary of Literary Terms", Cengage, Boston, 2015.
2. Scholes R, et.al., "Elements of Literature", IV, Indian Rpt. OUP, New Delhi, 2013.

HUMANITIES

19OFA1 EXPORT – IMPORT PRACTICES

1 0 0 1

INTRODUCTION : Export – Import Business – Preliminaries for starting Export – Import Business Registration. (3)

EXPORT PROCEDURES : Obtaining an Export License – Export Credit Insurance – Procedures and Documentation (4)

FOREIGN EXCHANGE : Finance for Exports – Pricing - Understanding Foreign Exchange Rates. (3)

IMPORT PROCEDURES : Import Policy – License - Procedure and Documentation. (3)

EXPORT INCENTIVES : Incentives - Institutional support (2)

Total L: 15

REFERENCES:

1. Ramagopal C, "Export Import Procedures - Documentation and Logistics", New Age International, 2014.
2. Cherian and Parab, "Export Marketing", Himalaya Publishing House, New Delhi, 2008.
3. Parul Gupta, "Export Import Management", MC-Graw Hill, 2017.
4. Justin Paul, Rajiv Aserkar, "Export Import Management", Oxford, 2013.

19OFA2 INSURANCE - CONCEPTS AND PRACTICES

1 0 0 1

INTRODUCTION TO INSURANCE AND RISK MANAGEMENT : Origin, History, Nature and Scope of insurance – Meaning, types and significance of risk. (3)

INSURANCE LAWS AND REGULATIONS : Insurance Act, IRDA Act, Consumer Protection Act, Ombudsman Scheme. (2)

INSURANCE UNDERWRITING AND RISK MANAGEMENT : Meaning of underwriting and underwriter, guidelines and steps in the process of underwriting – characteristics, significance and principles of risk management. (4)

FINANCIAL ASPECTS OF INSURANCE MANAGEMENT : Role and functions of financial institutions, determination of premium for various insurance products. (3)

SETTLEMENT OF INSURANCE CLAIMS : Documents needed during various claims, Factors affecting insurance claims (3)

Total L: 15

REFERENCES:

1. Scott Harrington, Gregory Niehaus, "Risk Management and Insurance", McGraw Hill Education, 2017.
2. George E Rejda, "Principles of Risk Management & Insurance", Pearson Education, 2017.
3. John Hull, "Risk Management & Financial Institution", John Wiley and Sons, 2018.
4. Arjun Mittal, D D Chaturvedi, "Insurance and Risk Management", Scholar Tech Press, 2017.

19OFA3 PUBLIC FINANCE

1 0 0 1

INTRODUCTION: Nature and Scope of public finance – Principles of taxation. (2)

PUBLIC REVENUE AND TAXATION: Sources of Revenue – Tax and non-tax revenue – Classification of Taxes, GST. (4)

PUBLIC EXPENDITURE: Importance – Types – Causes of increase in public expenditure – Effects of public expenditure in India. (3)

DEFICIT FINANCING AND BUDGET: Sources of public debt – Debt redemption – Budget – Types – Preparation of Budget in India. (3)

FEDERAL FINANCE: Centre-State financial relations – Finance commissions. (3)

TOTAL: 15

REFERENCE BOOKS:

1. Richard A Musgrave and Peggy B Musgrave, "Public Finance in Theory and Practice" – Tata McGraw Hill Education, New Delhi, 2004.
2. Bhatia H.L, "Public Finance" – Vikas Publishing House, 29th Edition, New Delhi, 2012.
3. David N Hyman, "Public Finance: A contemporary application of theory and policy", 11th Edition, Cengage Publication, Noida, 2014.

4. Santhosh Dalvi and Krishnan Venkatasubramanian, "An introduction to Goods and Service Tax: The biggest tax reform in India", CCH Publisher, New Delhi, 2015.

19OFA4 SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

1 0 0 1

INVESTMENT ENVIRONMENT : Financial Markets - Classification - Financial Instruments – Security Trading.	(2)
TYPES OF SECURITIES : Trading – Orders, Margin Trading – Clearing and Settlement Procedures.	(5)
SECURITY ANALYSIS I : Industry Analysis –Estimation of Rates of Return.	(2)
SECURITY ANALYSIS II : Company Analysis — Estimation of Rates of Return.	(2)
PORTFOLIO MANAGEMENT : Measuring Risk and Returns and Treatment in Portfolio Management.	(4)

Total L: 15

REFERENCES:

1. William F Sharpe, Gordon J. Alexander, Jeffery V Bailey , "Investments", Prentice Hall, 2012.
2. Prasanna Chandra, "Investment Analysis and Portfolio Management", TATA McGraw Hill Publishing, 2011.
3. Ranganathan, "Investment Analysis and Portfolio Management", Pearson, 2004.
4. Bhalla V K, "Investment Management", TATA McGraw Hill Publishing, 2011