Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester IV under Regulations 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15MAT401AR	Numerical Methods for Engineering Computation	3	2	0	4
2	U15CHE404R	Environmental Sciences	3	0	0	3
3	U15CE401R	Strength of Materials	3	2	0	4
4	U15CE402R	Transportation Engineering	3	0	0	3
5	U15CE403R	Applied Hydraulics and Fluid Machinery	3	0	0	3
6	U15CE404R	Concrete Technology	3	0	0	3
Practical						
7	U15CE405R	Hydraulic Engineering Laboratory	0	0	4	2
8	U15CE406R	Material Testing Laboratory	0	0	4	2
9	U15GE 401R	Soft Skills and Aptitude-II	0	0	2	1
					Total Credits	**25**

Approved By

Chairperson, Civil Engineering BoS — Dr.R.Malathy
Member Secretary, Academic Council — Dr.R.Shivakumar
Chairperson, Academic Council & Principal — Dr.M.Usha

Copy to:-
HOD/Civil, Fourth Semester BE Civil Students and Staff, COE

U15MAT401AR	NUMERICAL METHODS FOR ENGINEERING COMPUTATION	L	T	P	C
		3	2	0	4

COURSE OUTCOMES (On completion of the course, the students will be able to):

1. Explain the methods to solve algebraic and transcendental equations, solve the linear system of equations by direct or iterative methods and find the dominant Eigen value of a matrix.
2. Describe and apply the Newton's forward, backward and divided difference formulas, Lagrange's polynomial and cubic spline to obtain the polynomial interpolation.
3. Explain the Newton's forward, backward and divided difference formula to compute the derivatives of a tabular function at desired point and apply the Gaussian quadrature formula, Trapezoidal rule, Simpson's rule and Romberg's method to evaluate the numerical integration.
4. Solve the linear and nonlinear ordinary differential equations(ODE) of first and second order by single step methods and multi step methods.
5. Solve the boundary value problems (BVPs) in second order ODEs and elliptic, parabolic and hyperbolic PDEs by finite difference approximation.

UNIT-I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 15

Solution of algebraic and transcendental equations: Regula – Falsi method – Fixed point iteration method – Newton Raphson method. Solution of linear system of equations: Gauss elimination method – Gauss – Jordan method – Gauss – Jacobi and Gauss – Seidel methods. Matrix inversion by Gauss – Jordan method – Eigen values of a matrix by Power method.

UNIT-II INTERPOLATION AND APPROXIMATION 15

Interpolation with equal intervals: Newton's forward and backward difference formulae – Cubic spline interpolation. Interpolation with unequal intervals: Newton's divided difference interpolation – Lagrange's interpolation – inverse Lagrange's interpolation.

UNIT-III NUMERICAL DIFFERENTIATION AND INTEGRATION 15

Numerical differentiation: Approximation of derivatives using Newton's forward, backward difference and divided difference interpolation polynomials. Numerical integration: Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rule

UNIT-IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 15

Single step methods: Taylor series method – Euler's method – Modified Euler's method – Fourth order Runge – Kutta method for solving first and second order ordinary differential equations. Multi step methods: Milne's and Adams – Bash forth predictor and corrector methods for solving first order equations.

UNIT-V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 15

Ordinary differential equations: Finite difference method for solving two – point linear boundary value problems governed by second order ordinary differential equations. Partial differential equations: Classification of linear second order partial differential equations – Solution of parabolic partial differential equations by Bender – Schmidt explicit and Crank-Nicolson implicit methods – Solution of hyperbolic partial differential equations by explicit method – Solution of two dimensional Laplace PDEs by Liebmann's iteration process and Poisson PDEs.

TOTAL (L:45+T:30): 75 PERIODS

TEXT BOOKS:

1. S. Ponnusamy, "Numerical Methods", First Edition, Sonaversity, 2009.
2. T. Veerarajan and T. Ramachandran, "Numerical Methods with programs in C", Second Edition, Tata McGraw Hill Pub. Co. Ltd., 2008.

REFERENCES:

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, “Numerical Methods”, Fifth Edition, S. Chand & Co. Ltd., New Delhi, 2013.
2. C. F. Gerald and P. O. Wheatly, “Applied Numerical Analysis”, Seventh Edition, Pearson Education, New Delhi, 2004.
3. K. SankarRao, “Numerical Methods for Scientists and Engineers”, Third Edition, Prentice Hall of India P. Ltd., New Delhi, 2007.

U15CHE404R	ENVIRONMENTAL SCIENCE	L	T	P	C
		3	0	0	3

COURSE OUTCOMES (On completion of the course, the students will be able to):

1. State the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water, mineral, food, energy and land resources.
2. Explain the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
3. Define the various known kinds of environmental pollution and discuss their causes, effects and control measures.
4. Give an account of the social issues with regard to the environment.
5. Discuss the impact of human population on the environment.

UNIT-I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Definition, Scope and Importance – Need for public awareness – Forest Resources:- Use and over - exploitation, deforestation, Case Studies, Timber Extraction, Dams, Benefits and their effects on forests and tribal people - Water Resources:- Use and Over-Utilization of Surface and ground water , Floods, Drought, Conflicts Over Water – Mineral Resources:- Use–Environmental Effects of Extracting and Using Mineral Resources – Food Resources: World Food Problems, Changes caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer- Pesticide Problems, Water Logging, salinity – Energy Resources:- Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources – Land Resources:- Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification – Role of an Individual in Conservation of Natural Resources.

UNIT-II ECOSYSTEMS AND BIODIVERSITY 9

Concepts of an Ecosystem – Structure and Function of an Ecosystem – Producers, Consumers and Decomposers – Energy Flow in the Ecosystem – Biogeochemical Processes - Ecological Succession – Food Chains, Food Webs and Ecological Pyramids.

Introduction to Biodiversity – Definition: Genetic, Species and Ecosystem Diversity – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

UNIT-III ENVIRONMENTAL POLLUTION 9

Definition – Causes, Effects and Control Measures of:- (A) Air Pollution - Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Solid Waste Management:- Causes, Effects and Control Measures of Urban and Industrial Wastes, hazardous wastes and biomedical wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – Disaster Management:- Floods, Earthquake, Cyclone and Landslides – Wastewater treatment methods.

UNIT-IV SOCIAL ISSUES AND THE ENVIRONMENT 9

Sustainable Development – Urban Problems Related To energy – Water conservation, Rain Water Harvesting, Watershed Management – Resettlement and Rehabilitation of People, its Problems and Concerns – Environmental Ethics:- Issues and Possible Solutions –, Nuclear Accidents and Holocaust, Case Studies – Wasteland Reclamation – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Solid Waste Management Rules– Issues Involved in enforcement of Environmental Legislation – Public Awareness.

UNIT-V HUMAN POPULATION AND THE ENVIRONMENT 9

Population Growth, Variation Among Nations – Population Explosion – Family Welfare Programme – environment and Human Health – Human Rights – Value Education – HIV /AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health – Case Studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. K. Karunakaran et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2014.
2. "Environmental Science and Engineering" by Anubha Kaushik and C.P. Kaushik, New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

REFERENCES:

1. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
2. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co.
3. Erach, B., "The Biodiversity of India", Mapin Publishing P.Ltd.,Ahmedabad, India.
4. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad – 500029.

U15CE401R	STRENGTH OF MATERIALS	L	T	P	C
		3	2	0	4

COURSE OUTCOMES (On completion of the course, the students will be able to):

1. Familiarize the behavior of column under axial and eccentric loads.
2. Establish the slope and deflection in beams by using various methods.
3. Examine the problems related to thin and thick cylinders subjected to fluid pressure.
4. Understand the basic concepts of principle plane and stresses, theory of elasticity.
5. Determine the forces in plane truss members.

UNIT-I COMPRESSION MEMBERS 15

Column: Types- Modes of failure-Buckling load-Factor of safety- Euler's theory- Different end conditions- Rankine's-Gordon formula. Axial and eccentric loads- Direct, bending and combined bending stress- Calculation of combined bending stress: Core section- Middle third and Middle fourth rule.

UNIT-II DEFLECTION OF DETERMINATE BEAMS 15

Governing differential equation-Elastic curve for various types of beams-Slope and deflection: Macaulay's method- Moment area method- Conjugate beam method.

UNIT-III CYLINDERS 15

Thin cylinder: Circumferential and longitudinal stress- Shear stress- Volumetric strain. Thick cylinder: Lame's equation- Hoop and radial stress distribution- Compound cylinders.

UNIT-IV PRINCIPAL STRESS AND THEORIES OF ELASTIC FAILURE 15

Two dimensional state of stress at a point-Normal and shear stresses: Analytical method. Theories of failure: Maximum principal stress theory- Maximum shear stress theory- Maximum principal strain theory- Strain energy theory- Maximum shear strain energy theory-Simple Problems.

UNIT-V ANALYSIS OF PLANE MEMBERS 15

Elements and types of a truss-Determinacy and stability- Analysis of statically determinate plane truss: Method of joints-Method of sections- Method of tension coefficient.

TOTAL (L:45+T:30): 75 PERIODS

TEXT BOOKS:

1. Rajput R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2014.
2. Bansal R.K, "Strength of Materials", Laxmi Publications, New Delhi, 2017.

REFERENCES:

1. Chandramouli P.N, "Fundamentals of Strength of Materials", PHI Learning Private Limited, New Delhi, 2013.
2. Subramanian R, "Strength of Materials", Oxford University Press, New Delhi, 2010.

U15CE402R	TRANSPORTATION ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OUTCOMES (On completion of the course, the students will be able to):

1. Explain the various highway development and design cross section elements.
2. Determine the characteristics of pavement materials and design of pavement as per IRC.
3. Design of pavement as per IRC.
4. Apply the concepts of railway planning while designing the permanent way.
5. Plan the locations and design of the airport components.

UNIT-I INTRODUCTION TO HIGHWAY 9

Introduction to transportation systems, classification of roads, highway planning-Road cross section-Camber, gradient, super elevation- Sight distance: PIEV theory-Stopping sight distance-Over taking sight distance-Intermediate sight distance. Horizontal curves: Super elevation-Widening of pavements -Transition curves. Types of gradients-grade compensation on curves-Introduction to vertical curve.

UNIT-II HIGHWAY MATERIALS 9

Pavement Materials: Desirable properties and testing of highway materials-Soil: California bearing ratio test, field density test; Aggregate: Crushing, abrasion, impact, water absorption, flakiness and elongation indices and stone polishing value test; Bitumen: Penetration, ductility, viscosity and softening point test.

UNIT-III PAVEMENT DESIGN 9

Pavement Design: Rigid and flexible pavements- Components and their functions- Factors affecting the design of pavements; Design practice for flexible pavements (IRC method and recommendations-problems)-Design practice for rigid pavements (IRC recommendations - concepts only). Types of road constructions: Water Bound Macadam, bituminous and cement concrete road.

UNIT-IV RAILWAY ENGINEERING 9

Role of Indian railways in national development- Permanent way, its components and function: Rails, sleepers and ballast- types of rails, rail fastenings, concept of gauges, coning of wheels, creeps and kinks. Geometric design of railway tracks-Gradients and grade compensation, super-elevation, widening of gauges in curves (Concepts only) - Points and crossings -Railway stations and yards - Signaling and interlocking.

UNIT-V AIRPORT ENGINEERING 9

Introduction to air transport –Site selection- Airport obstructions and zoning. Components of air port- Runway: Orientation-Wind rose diagrams (theory only)-Runway length-Runway configuration and drainage-Taxiway -Aircraft parking configuration and parking system - Visual aids.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Khanna K, and Justo C E G, “Highway Engineering”, Khanna Publishers, Roorkee, 2015.
2. Saxena Subhash C, and Satyapal Arora, “A Course in Railway Engineering”, Dhanpat Rai and Sons, Delhi, 2003
3. Khanna S K, Arora M G, and Jain S S, “Airport Planning and Design”, Nemchand and Brothers, Roorkee, 2012.

REFERENCES:

1. Kadiyali L.R, “Principles and Practice of Highway Engineering”, Khanna Technical Publications, New Delhi, 2013.
2. Rangwala, “Railway Engineering”, Charotar Publishing House, 2013.
3. Rangwala, “Airport Engineering”, Charotar Publishing House, 2013.

U15CE403R	APPLIED HYDRAULICS AND FLUID MACHINERY	L	T	P	C
		3	0	0	3

COURSE OUTCOMES (On completion of the course, the students will be able to):

1. To solve problem in uniform flow in steady state condition.
2. To solve problems in gradually varied flows in steady state condition.
3. To solve problem rapidly varied flows in steady state condition.
4. Design various types of pumps.
5. Design various types of turbines.

UNIT-I OPEN CHANNEL FLOW **9**

Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Specific force -Critical flow and its computation – channel transition.

UNIT-II UNIFORM FLOW **9**

Uniform flow – Manning's and Chezy's formula – Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections-Velocity measurement-Non-erodible channels.

UNIT-III VARIED FLOW **9**

Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination –Direct step and standard step method – Flow through transitions - Hydraulic jump – Types – Energy dissipation – Surges.

UNIT-IV TURBINES **9**

Turbines - Draft tube and cavitations – Application of moment of momentum principle – Impact of jets on plane and curved plates - Turbines - Classification - Radial flow turbines - Axial flow turbines – Impulse and Reaction-Specific speed of turbine.

UNIT-V PUMPS **9**

Centrifugal pump - Minimum speed to start the pump –Net positive suction head- Multistage pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions – Specific speed.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Bansal R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2017.
2. Rajput R.K., "Fluid Mechanics and Hydraulic Machines", S. Chand Publishing Ltd, New Delhi, 2013.

REFERENCES:

1. Kumar K.L, "Engineering Fluid Mechanics", Eurasia Publishing House Pvt. Ltd, New Delhi, 1995.
2. Modi P.N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi. 2004.
3. Subramanya K, "Fluid Mechanics and Hydraulic Machines-Problems and Solutions", Tata McGraw Hill Education, New Delhi, 2010.

		L	T	P	C
U15CE404R	**CONCRETE TECHNOLOGY**	**3**	**0**	**0**	**3**

COURSE OUTCOMES (On completion of the course, the students will be able to):

1. Determine the properties of fresh and hardened of concrete.
2. Apply a suitable admixture in the required field conditions.
3. Design the concrete mix using ACI and IS code methods.
4. Evaluate the properties and applications of special concretes.
5. Diagnose the strength and durability of concrete structures with different testing methods.

UNIT-I FRESH AND HARDENED CONCRETE 9

Fresh concrete: Mechanism of hydration-Water-Cement ratio-Factors affecting strength of the concrete-Workability - Concepts and tests as per Indian codal specifications. Concrete manufacturing stages: Batching - Mixing -Transportation - Placing of concrete -Curing of concrete. Water: Quality of water for mixing and curing - Use of sea water for mixing Concrete. Hardened concrete: Properties and tests-Strength of concrete - Temperature effects - Creep of concrete -Thermal properties of concrete - Micro cracking of concrete.

UNIT-II ADMIXTURES 9

Admixtures -Necessity-Types-Chemical admixtures with specific properties - Accelerators - Retarders -Plasticizers and super plasticizers - Air entraining admixtures-Water proofers -Coloring agent. Mineral admixtures-Fly ash-Slag -Micro and nano silica-Mineral additives and fillers.

UNIT-III MIX DESIGN 9

Mix Design-Factors influencing mix proportion-Variability in test results -Quality control -Sampling and acceptance criteria-Mix design by American concrete institute method and Indian standard code method.

UNIT-IV SPECIAL CONCRETES AND CONCRETING METHODS 9

Special concretes: Light weight concrete - Fibre reinforced concrete - Polymer concrete - Ferrocement - Ready mix concrete- Self compacting concrete - High strength concrete - High performance concrete-Pervious concrete - Bio and bacterial concrete - Smart concrete; Concrete methods: Extreme weather concreting - Vacuum dewatering concreting - Underwater concreting - Guniting and shotcreting

UNIT-V NON-DESTRUCTIVE TEST AND DURABILITY OF CONCRETE 9

Non destructive tests: Rebound hammer-Ultra sonic pulse velocity test. Durability of concrete-Mechanism of corrosion - Causes and effects-Permeability of concrete-Shrinkage-Plastic shrinkage -Drying shrinkage-Chemical attack-Sulfate attack of concrete structures - chloride attack- Remedial measures.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Shetty, M.S., “Concrete Technology”, Theory & Practice, S.Chand and Co, 2012.
2. Santakumar A.R., “Concrete Technology”, Oxford University Press, New Delhi, 2012.

REFERENCES:

1. Kumar Mehta P, Paulo, and Moteiro J. M, “Concrete-Micro Structure, Properties and Materials”, 3rd Edition, Mcgraw Hill, 2006
2. Gambhir M.L, “Concrete Technology”, Tata McGraw Hill, 2012.
3. Nevile, “Properties of Concrete”, Longman Publishers, 2008.

U15CE405R	HYDRAULIC ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OUTCOMES (On completion of the course, the students will be able to):

1. Measure the flow, discharge and energy loss in pipes and open channel.
2. Demonstrate the characteristics curves of pumps and turbines.
3. Apply the technical concepts and ways to solve engineering problems by conducting experiments.

COURSE CONTENTS

1. Flow through venture meter and orifice meter
2. Flow through variable duct area - Bernoulli's experiment
3. Flow through orifice, mouthpiece and notches
4. Determination of friction coefficient in pipes
5. Determination of minor losses
6. Characteristics of centrifugal pumps
7. Characteristics of reciprocating pump
8. Characteristics of pelton wheel turbine
9. Characteristics of francis turbine
10. Characteristics of kaplan turbine
11. Study on performance characteristics of centrifugal pumps (Constant speed / Variable speed)
12. Study on performance characteristics of reciprocating pump
13. Study of impact of jet on flat plate (normal / inclined)
14. Determination of meta centric height (Demonstration)

TOTAL: 60 PERIODS

U15CE406R	MATERIAL TESTING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OUTCOMES (On completion of the course, the students will be able to):

1. Determine the physical properties of given cement, fine aggregates coarse aggregates and wooden sample.
2. Evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens.
3. Apply the technical concepts and ways to solve engineering problems through conducting experiments.

COURSE CONTENT S

Steel: Stress-strain characteristics - Young's modulus -Hardness -Impact strength-Shear strength.
Evaluation of Stiffness on helical spring.
Stiffness and modulus of rigidity of the specimen using torsion testing machine.
Deflection test on cantilever and simply supported beam.
Brick/Building blocks: Shape and Size-Efflorescence-Compressive strength-Water absorption- Field test.
Wood: Compressive strength.
Cement: Specific gravity test- Fineness -Consistency test- Setting time- Soundness -Compressive strength of cement mortar cubes- Field test.
Fine aggregate: Specific gravity test- Bulking of sand-Fineness modulus.
Coarse aggregate: Specific gravity test-Crushing strength-Impact strength-Shape test-Water absorption- Fineness modulus.

TOTAL: 60 PERIODS

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2015R (CBCS)
Branch: Mechanical Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15MAT401DR	Statistics and Numerical Methods	3	2	0	4
2	U15ME401R	Kinematics of Machinery	3	0	0	3
3	U15ME402R	Thermal Engineering	3	0	0	3
4	U15EE409R	Electrical Drives and Microprocessor	3	0	0	3
5	U15ME403R	Applied Hydraulics and Pneumatics Systems	3	0	0	3
6	U15ME404R	Engineering Materials and Metallurgy	3	0	0	3
Practical						
7	U15ME405R	Thermal Engineering Laboratory	0	0	4	2
8	U15EE410R	Electrical Drives and Microprocessor Laboratory	0	0	4	2
9	U15ENG401R	Communications Skills Laboratory	0	0	2	1
10	U15GE401R	Soft Skills and Aptitude-II	0	0	2	1
					Total Credits	**25**

Approved By

Chairperson, Mechanical Engineering BoS — Dr.D.Senthilkumar
Member Secretary, Academic Council — Dr.R.Shivakumar
Chairperson, Academic Council & Principal — Dr.M.Usha

Copy to:-
HOD/Mechanical Engineering, Fourth Semester BE Mechanical Students and Staff, COE

		L	T	P	C
Course Code	**U15MAT401DR**				
Course Name	**STATISTICS AND NUMERICAL METHODS**	3	2	0	4

Pre-requisites subject: Engineering Physics and Transforms & Partial differential equations

Course Outcomes

Upon completion of this course the students will be able to

CO1 Explain the basic terminologies used in the testing of hypothesis, test the hypothesis for attributes and variables with large samples and small samples,

CO2 Describe the formulation of design experiments and explain the conclusions they give

CO3 Describe the methods for solving a transcendental equation, a linear system of equations by direct and indirect methods and explain the power method

CO4 Define and explain the terms differences, process of interpolation, numerical differentiation and integration and state the rules involved

CO5 Provide an overview of different methods of finding numerical solutions to ordinary and partial differential equations

Unit I TESTING OF HYPOTHESIS L 9 T 3

Testing of hypothesis for proportions, means, standard deviations using z and t - chi – square test for population variance, goodness of fit, independence of attributes – F – test.

Unit II DESIGN OF EXPERIMENTS L 9 T 3

Completely randomized design, randomized block design, Latin square design , 2^2, factorial design

Unit III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS L 9 T 3

Newton – Raphson method, Gauss elimination method, pivoting, Gauss – Jordan methods, iterative methods of Gauss-Jacobi and Gauss- Seidel ,matrix inversion by Gauss -Jordan method, eigen values of a matrix by power method

Unit IV INTERPOLATION, NUMERICAL DIFFERENTIATION & NUMERICAL INTEGRATION L 9 T 3

Lagrange's and Newton's divided difference interpolation, Newtion's forward and backward difference interpolation, approximation of derivatives using interpolation polynomials, numerical integrating using Trapezoidal and Simpson's 1/3 rules

Unit V INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS L 9 T 3

Taylor series method, Euler and modified Euler methods, fourth order Runge – Kutta method for solving first and second order equations, Milne's and Adam's predictor and corrector methods.

Total Number of hours: 60

Learning Resources

Text Books

1. Ponnusamy S., and Santha Kumaran A., "Statistics and Numerical Methods", Sonaversity, 1st Edition, 2009
2. Johnson R.A., and Gupta C.B., "Miller and Freund's, "Probability and Statistics for Engineer's", Pearson Education, Asia, 7th Edition, 2007

Reference Books

1. Grewal, B.S., and Grewal J.S., "Numerical Methods in Engineering and Science", khanna publishers, New Delhi, 6th Edition, 2004
2. Walpole R.E, Myers R.H., and Kye., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007
3. Gerald, C.F and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, 6th Editions, 2006

Course Code	**U15ME401R**	L	T	P	C
Course Name	**KINEMATICS OF MACHINERY**	3	0	0	3

Pre-requisites subject: Engineering Physics and Mathematical geometry

Course Outcomes

Upon completion of this course the students will be able to

CO1 To understand the layout of linkages in the assembly of a system/machine.

CO2 To investigate the principles involved in assessing the displacement, velocity and acceleration at any point in a link of a mechanism.

CO3 To understand the theory of Machine element cams.

CO4 To understand the theory of Machine element gear, and gear trains.

CO5 To understand the role of friction in clutches and brakes.

Unit I BASICS OF MECHANISMS L 7 T 0

Basic concepts of Link, Kinematic pair, Kinematic chain, Mechanism, Machine, Degree of Freedom, Kutzbach and Grubler's criterion and Grashoff's law - Kinematic Inversions of four bar chain and slider crank chain - Mechanical Advantage - Transmission angle.

Description of common Mechanisms – Single, Double and Offset slider mechanism. Straight line Mechanisms (Exact & Approximate Straight line).

Unit II KINEMATICS OF LINKAGE MECHANISMS L 10 T 0

Analysis of simple mechanisms (slider crank mechanism, four bar mechanism) - Graphical methods for displacement, velocity and acceleration polygons; Coincident points – Coriolis acceleration – velocity and acceleration polygons.

Velocity analysis using instantaneous centers of simple mechanisms (Single slider crank mechanism and four bar mechanism).

Unit III KINEMATICS OF CAM MECHANISMS L 10 T 0

Classifications of cam and follower – Displacement, Velocity & Acceleration diagram – Follower Motion (Uniform Velocity Motion, Simple Harmonic Motion, Uniform Acceleration and Retardation motion, Cycloidal motions) – Graphical construction of displacement, Velocity & Acceleration diagram and cam profile for a radial cam - Pressure angle and undercutting.

Unit IV GEARS AND GEAR TRAINS L 10 T 0

Classification of gears – Gear tooth terminology - Fundamental Law of toothed gearing and involute gearing – Length of path of contact and contact ratio - Interference and undercutting – Nonstandard gear teeth – helical, bevel, worm, rack and pinion gears (basics only). Gear trains – Simple, compound

and Epicyclic gear trains.

Unit V FRICTION IN MACHINE ELEMENTS L 8 T 0

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Friction in screw jack – Friction clutches –Single plate clutch and Multi plate clutch – Friction aspects in brakes – Band and Block brakes.

Total Number of Periods: 45

Text Books

1. Sadhu Singh, "Theory of Machines", Pearson Education, New Delhi, 3rd Edition, 2011, ISBN-13: 978-8131760697.
2. S.S.Rattan, "Theory of Machines & Mechanisms", Tata Mcgraw hill publishers, 4th Edition, 2014, ISBN-13: 978-9351343479.
3. Ambekar A. G., Mechanism and Machine Theory, Prentice Hall of India, New Delhi, 2007, ISBN-13: 978-8120331341.
4. Uicker J.J.,Pennock G.R., Shigley J.E., "Theory of Machines and Mechanisms"(Indian Edition), Oxford University Press, 2014, ISBN-13: 978-0199454167.

Reference Books

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 3rd Edition, 2005, ISBN-13: 978-8123908748.
2. Ramamurti,V.,'' Mechanism and Machine Theory", Second Edition, Narosa Publishing House, New Delhi, 3rd Edition, 2010, ISBN: 978-81-7319-892-2.
3. Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East- West Pvt. Ltd., New Delhi, 2008, ISBN-13: 978-8185938936.
4. Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley-Eastern Ltd., New Delhi, 2nd Edition, 1992, ISBN-13: 978-8122404265.
5. John Hannah and Stephens R.C, "Mechanics of Machines", Viva Low-Prices, Student Edition, 1999.
6. P.L.Ballaney, "Theory of Machines", Khanna publishers, 23rd Edition, 2003,ISBN817409122X, 9788174091222.

Course Code	U15ME402R	L	T	P	C
Course Name	THERMAL ENGINEERING	3	0	0	3

Pre-requisites subject: Engineering Physics, Engineering Mathematics and Engineering Thermodynamics.

Course Outcomes

Upon completion of this course the students will be able to

- **CO1** Explain the P-V & T-S diagram, mean effective pressure and air standard efficiency of various gas power cycles.
- **CO2** Describe the working principle, combustion phenomenon, and ignition system and performance test of Internal Combustion engine.
- **CO3** Describe the steam flow through nozzle and steam power cycle.
- **CO4** Define the concept, types and performance characteristics of air compressor.
- **CO5** State the fundamentals of Refrigeration and Air conditioning systems with p-h chart and their cycle.

Unit I GAS POWER CYCLES L 9

Otto, Diesel, Dual, Brayton cycles. P-V and T-S diagram, Calculation of mean effective pressure and air standard efficiency, comparison of Otto, diesel and dual cycles.

Unit II INTERNAL COMBUSTION ENGINES L 9

Classification of I.C engines, four stroke and two stroke cycle engines, combustion phenomenon and knocking in SI and CI engine, Valve and port timing diagrams – super-charging - Ignition system and fuel injection system. Cooling and lubrication system. Engine tests - performance, heat balance, and retardation - Morse test.

Unit III NOZZLES AND STEAM POWER CYCLES L 9

Steam nozzles- flow through steam nozzles, effect of friction, critical pressure ratio and super saturated flow. Steam power cycle-Properties of steam, Rankine, Reheat and regeneration cycle.

Unit IV AIR COMPRESSORS L 9

Classifications of compressors - Reciprocating air compressor - performance characteristics, effect of clearance volume, free air delivery and displacement, intercooler, after cooler – Description of Rotary compressor, vane, centrifugal and axial compressors.

Unit V REFRIGERATION AND AIR CONDITIONING L 9

Fundamentals of refrigeration – COP - Vapour compression refrigeration system - cycle, p-h chart, Vapour absorption system- comparison, properties of refrigerants. Fundamentals of air conditioning system, types and working principles, simple cooling load estimation.

Total Number of hours: 45

Learning Resources

Text Books

1. R.K.Rajput, “Thermal Engineering” , Laxmi Publications, New Delhi, Sixth edition, 2005
2. Kothandaraman C.P, Domkundwar and A.V. Domkundwar, “A course in Thermal Engineering”, Dhanpat Rai & Sons, Fifth Edition, 2002.

Reference Books

1. Holman J.P. “Thermodynamics”, McGraw-Hill, 1985.
2. Arora C.P., “Refrigeration and Air conditioning”, Tata McGraw-Hill, New Delhi, 2000.
3. Sarkar B.K., “Thermal Engineering”, Tata McGraw-Hill, New Delhi New Delhi, 2001.
4. V.Ganesan, “Internal Combustion Engines”, Tata McGraw-Hill, New Delhi, 2008.

Course Code	U15EE409R	L	T	P	C
Course Name	ELECTRICAL DRIVES AND MICROPROCESSOR	3	0	0	3

Course Outcomes

Upon completion of this course the student will be familiar with

- **CO1** Explain the Construction, operation, characteristics of DC generator and DC motors.
- **CO2** Explain the Construction, Types, Operation and characteristics of three phase Induction motor.
- **CO3** Describe about Types of electric drives, Heating and cooling curves.
- **CO4** Discuss about the Speed control of DC motors and three phase induction motor.
- **CO5** Identify the features of Intel 8085 Microprocessor and writing simple programs.

Unit I DC MOTORS L 9 T 0

Construction, principle of operation, torque-speed characteristics - Starters-Speed control of DC series and shunt motors (Conventional Methods) – Armature and field control, Ward-Leonard control system, Applications.

Unit II AC MOTORS L 9 T 0

Three-phase induction motor: Construction- types- principle of operation- torque-slip characteristics-starting methods and speed control (Conventional Methods)-Single phase Induction motor, Applications.

Unit III ELECTRIC DRIVES INTRODUCTION L 9 T 0

Basic Elements – Types of Electric Drives – factors are influencing the choice of electrical drives – Heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.

Unit IV SOLID STATE SPEED CONTROL OF AC AND DC DRIVES L 9 T 0

Introduction- Half wave and Full Wave Rectifiers -Single phase half controlled and fully controlled bridge rectifier fed DC drives- single phase full bridge inverter with resistive and inductive load-voltage source inverter(VSI) and current source inverter (CSI) fed induction motor drives-slip power recovery scheme (Scherbious system and Kramers system).

Unit II 8085 MICROPROCESSOR L 9 T 0

Intel 8085 Architecture – Intel 8085 Pin Diagram and its functions- Instruction set – Addressing modes – Simple Assembly language Programming – Interrupts.

Total Number of hours: 45

Learning Resources

TEXT BOOKS:

1. D.P. Kothari and I.J. Nagrath, "Electric Machines", Tata McGraw Hill Publishing Company Ltd, Fourth Edition 2010.
2. VedamSubramanyan, Electrical Drives concepts and applications, Tata Mc Graw Hill Publications, 2014
2. Gaonkar, R. S., "Microprocessor Architecture, Programming and application with 8085", 6th Edition, Penram International Publishing, 2013.

REFERENCE BOOKS:

1. Pillai.S.K"AfirstcourseonElectricdrives",WileyEasternLimited, 3rd Edition Reprint 2015.

Course Code	U15ME403R	L	T	P	C
Course Name	APPLIED HYDRAULICS AND PNEUMATICS SYSTEMS	3	0	0	3

Pre-requisites subject: Fluid Mechanics

Course Outcomes

Upon completion of this course the students will be able to

- **CO1** Apply the pump theory and classifications and able to use the fluid power in his/her professional career.
- **CO2** Demonstrate the principle of hydraulic cylinders and fluid motors, Gear, Vane and Piston motors.
- **CO3** Compare accumulators and intensifiers and justify the usage of accumulators on real time feedback circuits in their professional career.
- **CO4** Differentiate the different Pneumatic approaches for simple applications and able to synthesis the new approach specific to their application.
- **CO5** Define fluidic devices applications with basic trouble shooting methodologies and types of Servo systems.

Unit I FLUID POWER SYSTEMS AND POWER GENERATOR L 9 T 0

Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Fluid power symbols.

Sources of Hydraulic Power: Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps

Unit II CONTROL AND ACTUATION ELEMENTS L 9 T 0

Construction of Control Components : Direction control valves – 3/2 way valve – 4/2 way valve – Shuttle valve – check valve – pressure control valve – pressure reducing valve, sequence valve, Flow control valve – Fixed and adjustable -electrical control solenoid valves, Relays.

Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting -special cylinders like-Tandem, Rod-less, Telescopic, Cylinder cushioning mechanism, Construction of double acting cylinder, Rotary actuators – Fluid motors, Gear, Vane and Piston motors.

Unit III HYDRAULIC CIRCUITS L 9 T 0

Hydraulic circuits-reciprocating–quick return-pressure sequencing circuit- Regeneration circuit Drilling circuit, synchronizing circuit, speed control-meter in, meter out and bleed off circuit, safety circuits

Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, intensifier – Applications of Intensifier – Intensifier circuit.

Unit IV PNEUMATIC SYSTEMS AND CIRCUITS L 9 T 0

Pneumatic Components: Properties of air – Compressors – Filter, Regulator, and Lubricator Unit – Air control valves, Quick exhaust valves, and pneumatic actuators. Fluid Power Circuit Design, Pneumo-hydraulic circuit, Sequential circuit design for simple applications using cascade method.

Unit V SPECIAL SYSTEM AND MAINTENANCE L 9 T 0

Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and hydro pneumatic circuits -Introduction to logic circuits.

Introduction to fluidic devices, simple circuits, ladder diagrams, PLC applications in fluid power control circuit –fault finding -Failure and troubleshooting. Low cost automation. Automation requirements for industry 4.0.

Total Number of hours: 45

Learning Resources

Text Books

1. Anthony Esposito, "Fluid Power with Applications", 7th edition, Pearson Education 2005. ISBN:9789332518544,ISBN-10:9332518548.
2. Majumdar S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw-Hill, 2001. ISBN: 9780074637487.

Reference Books

1. Dudelyt, A. Pease and John T. Pippenger, "Basic Fluid Power", Prentice Hall, 2007 .
2. Michael J, Prinches and Ashby J. G, "Power Hydraulics", Prentice Hall, 2009.
   ISBN10:136874436 ISBN13: 9780136874430.
3. Anthony Lal, "Oil hydraulics in the service of industry", Allied publishers, 2002.
4. Shanmugasundaram.K, "Hydraulic and Pneumatic controls", Chand & Co, 2006. ISBN-10: 8121926351,ISBN-13: 978-8121926355.
5. Majumdar S.R.- "Pneumatic systems - Principles and maintenance"-Tata McGraw Hill- 1995 ISBN 10: 0074602314 ISBN 13: 9780074602317.
6. DrA.K.Bewoor , S C Shilwant, " Hydraulics and Pneumatics" Jul 2014,NiraliPrakashan ISBN-10: 9351641341ISBN-13: 978-9351641346.
7. Andrew Parr, "Hydraulics and Pneumatics: A Technician's and Engineer's Guide,2011,Butterworth-Heinemann. ISBN-10: 0080966748,ISBN-13: 978-0080966748.

Course Code	U15ME404R	L	T	P	C
Course Name	ENGINEERING MATERIALS AND METALLURGY	3	0	0	3

Pre-requisites subjects: Engineering Chemistry, Engineering Physics

Course Outcomes

Upon completion of this course the students will be able to

CO1	Explain on various constitutions of alloys with their formation reactions of solid solutions and phase diagrams.
CO2	Discuss the various heat treatments process and understand different kinds of heat treatment diagrams.
CO3	Describe the Various ferrous & non-ferrous metals and its various alloys in the engineering scope.
CO4	Explain the basic non-metals with its properties and its importance to the metals and differentiate themselves with the normal metals and their alloys.
CO5	List the basic mechanical properties of various materials available with its testing methods.

Unit I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS L 9 T 0

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectoid, eutectic, peritectic, and peritectroid reactions, Iron – Iron carbon equilibrium diagram. Classification of steel and cast Iron, microstructure, properties and applications.

Unit II HEAT TREATMENT L 9 T 0

Definition – Full annealing, process, stress relief, recrystallization and spheroidising –normalizing, hardening and tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram, CCR - Hardenability, Jominy end quench test –Austempering, martempering – case hardening - carburizing, nitriding, cyaniding, carbonitriding, flame and induction hardening.

Unit III FERROUS AND NONFERROUS METAL L 9 T 0

Effect of alloying elements on steel (Mn, Si, Cr, Mo, V, Ti& W) - stainless and tool steels– HSLA - maraging steels – Cast Irons - Grey, White, malleable, spheroidal graphite, alloy cast irons - Copper and Copper alloys - Brass, Bronze and Cupronickel – Aluminum and Al-Cu alloy – precipitation hardening– Bearing alloys.

Unit IV NON-METALLIC MATERIALS L 9 T 0

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK,PTFE Polymers – Urea and Phenol Formaldehydes – Engineering Ceramics –Introduction to fibre reinforced plastics.

Unit V MECHANICAL PROPERTIES AND TESTING L 9 T 0

Mechanism of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Impact test - Izod and Charpy, Fatigue and creep tests, fracture toughness tests.

Total Number of hours: 45

Learning Resources

Text Books

1. Kenneth G.Budinski and Michael K.Budinski "Engineering Materials" Prentice-Hall of India Private Limited, 4th Indian Reprint 2002.
2. R.K.Rajput "Engineering Materials & Metallurgy" S Chand Publications. 2006
3. O.P. Khanna, A text book of Materials Science and Metallurgy, Khanna Publishers, 2014.

Reference Books

1. William D Callister, "Material Science and Engineering", John Wiley and Sons 2007.
2. Raghavan.V "Materials Science and Engineering", Prentice Hall of India Pvt., Ltd., 2007.
3. Sydney H.Avner "Introduction to Physical Metallurgy" McGraw Hill Book Company, 2007.

Course Code	U15ME405R	L	T	P	C
Course Name	THERMAL ENGINEERING LABORATORY	0	0	4	2

Pre-requisites subject: Engineering thermodynamics and Thermal engineering.

Course Outcomes

Upon completion of this course the students will be able to

- **CO1** Identification of components and experience the function of components of Internal combustion engine.
- **CO2** Practical exposure on the actual timing of valve or port opening and closing of an IC engine.
- **CO3** Analysis of performance of an IC engine under various loading methods.
- **CO4** Compare the volumetric efficiency under various delivery pressures.
- **CO5** Evaluate the C.O.P of refrigeration and air conditioning systems.

LIST OF EXPERIMENTS **Total Hours 45**

1. Valve Timing and Port Timing Diagrams.
2. Performance Test on 4-stroke Diesel Engine.
3. Heat Balance Test on 4-stroke Diesel Engine.
4. Retardation Test to find Frictional Power of a Diesel Engine.
5. Determination of Calorific value of Fuel using Bomb Calorimeter.
6. Determination of Viscosity using Red Wood Viscometer.
7. Determination of Flash Point and Fire Point.
8. Performance test on reciprocating air compressor.
9. Determination of COP of a Refrigeration system.
10. Determination of COP of an air conditioning system
11. Demo on Morse Test on Multi cylinder Petrol Engine.

LIST OF EQUIPMENTS (for a batch of 30 students)

1. Single Cylinder 4-Stroke 5 HP Kirloskar Diesel Engine With Eddy Current Dynamometer.
2. Single Cylinder 4-Stroke 5 HP Kirloskar Diesel Engine With Electrical Loading
3. Single Cylinder 4-Stroke 5 HP Kirloskar Diesel Engine With Mechanical Loading
4. Multicylinder 4-Stroke Isuzu Petrol Engine With Hydraulic Dynamometer and Exhaust Gas Calorimeter.
5. Twin Cylinder 4-Stroke Texvel Diesel Engine With Bulb Loading And Exhaust Gas Calorimeter.
6. Cut Section Model of Actual Single Cylinder 4-Stroke Petrol Engine.
7. Cut Section Model of Actual Single Cylinder 4-Stroke Diesel Engine.
8. Section Model of Actual Single Cylinder 2-Stroke Petrol Engine.
9. Two Stage Air Compressor Test Rig.
10. Flash and Fire Point Apparatus.
11. Red Wood Viscometer.
12. Refrigeration Test Rig.
13. Air Conditioning Test Rig.
14. Bomb Calorimeter.

Course Code	U15EE410R	L	T	P	C
Course Name	ELECTRICAL DRIVES AND MICROPROCESSOR LABORATORY	0	0	4	2

Total Hours 45

List of Experiments:

1. Load test on DC Shunt motor.
2. Load test on DC Series motor.
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on three phase squirrel cage Induction motor
5. Load test on single phase Induction Motor.
6. Speed control of three phase slip ring Induction Motor.
7. Single phase half controlled converter using R, RL Loads.
8. Single phase fully controlled converter using R, RL Loads.
9. Speed control of DC motor using 3Phase converter.
10. Speed control of 3Phase Induction motor using Voltage Source Inverter (VSI).
11. Addition and Subtraction of two 8 bit numbers using Intel 8085 Microprocessor (Programming with control instructions)
12. Multiplication and Division of two 8 bit numbers using Intel 8085 Microprocessor (Programming with control instructions)

STUDY

1. Study of DC motor starters.
2. Study of AC motor starters.
3. Study of auto-transformers.
4. Study of current, voltage and power measuring instruments.

Semester – IV	U15GE401R: SOFT SKILLS AND APTITUDE -II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I* in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate verbal aptitude with regard to given topics and score 65-70% marks in placement specific internal tests

1.Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2.Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Number system b. H.C.F and L.C.M c. Averages d. Percentages e. Ratio and Proportion f. Problems on Ages g. Partnership h. Allegation and Mixture i. Profit and Loss j. Time and Distance k. Problems on Trains l. Permutation and Combination m. Probability n. Time and Work o. Pipes and Cisterns p. Clocks q. Blood Relations r. Seating Arrangement s. Symbols and Series t. Syllogism u. Direction Sense v. Coding and Decoding w. Cubes and Dice x. Arithmetic Reasoning y. Company specific aptitude questions

3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Synonyms b. Antonyms c. Verbal analogy d. Editing passages e. Sentence filler words (one and two) f. Jumbled sentences g. Reconstruction of sentences (PQRS) h. Idioms and phrases i. Spotting errors j. Writing captions for given pictures k. Tenses l. Prepositions m. Reading comprehension n. Choosing the correct / incorrect sentences o. Describing given pictures p. Critical reasoning q. Theme detection r. Articles s. Cloze test t. Company specific aptitude questions

* SSA-I is Soft Skills and Aptitude – I

Sona College of Technology, Salem

(An Autonomous Institution)

Courses of Study for B.E/B.Tech.Semester IV under Regulations 2015R (CBCS)

Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15EE401R	Signals and Systems	2	2	0	3
2	U15EE402R	Electrical Machines – II	2	2	0	3
3	U15EE403R	Generation, Transmission and Distribution Systems	2	2	0	3
4	U15EE404R	Measurement and Instrumentation	3	0	0	3
5	U15EE405R	Control Systems	2	2	0	3
6	U15EE406R	Digital Logic Circuits	2	2	0	3
Practical						
7	U15EE407R	Control and Instrumentation Laboratory	0	0	4	2
8	U15EE408R	Electrical Machines Laboratory – II	0	0	4	2
9	U15GE401R	Soft Skills and Aptitude – II	0	0	2	1
					Total Credits	**23**

Approved By

Chairperson, Electrical and Electronics Engineering BoS Dr.S.Padma

Member Secretary, Academic Council Dr.R.Shivakumar

Chairperson, Academic Council & Principal Dr.M.Usha

Copy to:-

HOD/Electrical and Electronics Engineering, Fourth SemesterBE EEE Students and Staff, COE

U15EE401R SIGNALS AND SYSTEMS 2 2 0 3

COURSE OUTCOMES:

1. Explain the basic properties of signal & systems and the various methods of classification.
2. Apply Laplace transform & Fourier transform for continuous signals and systems analysis.
3. Analyse discrete time signals and linear time invariant systems.
4. Analyse LTI systems in the time domain and various transform domains.
5. Analysediscrete transforms properties.

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 12

Continuous Time signals (CT signals) – Discrete Time signals (DT signals) – step, ramp, pulse, impulse, sinusoidal, exponential, classification of CT and DT signals – periodic & aperiodic signals, deterministic & random signals, energy & power signals – CT systems and DT systems-classification of systems – static & dynamic, linear & nonlinear, time-variant & time-invariant, causal & non-causal, stable & unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS AND LTIV SYSTEMS 12

Fourier and Laplace transforms in CT Signal analysis – Fourier and Laplace transforms in analysis of CT systems.

UNIT III ANALYSIS OF DISCRETE TIME SIGNALS 12

Baseband sampling – DTFT – properties of DTFT – Z transform – properties of Z transform.

UNIT IV LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS 12

Difference equations – block diagram representation – impulse response – convolution sum – discrete Fourier and Z transform analysis of recursive & non-recursive systems.

UNIT V DISCRETE TRANSFORMS 12

DFT – definition – properties, computation of DFT using FFT algorithm – DIT & DIF – FFT using radix-2 – butterfly structure – computation of IDFT using DFT.

Lecture: 30; Tutorial: 30; Total: 60 Hours

TEXT BOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson Education, 2007.
2. Edward W Kamen& Bonnie’s Heck, “Fundamentals of Signals and Systems”, Pearson Education, 2007.

REFERENCES:

1. H.P.Hsu, Rakesh Ranjan, “Signals and Systems”, Schaum’s Outlines, Tata McGraw Hill, Indian Reprint, 2007
2. S.Salivahanan, A.Vallavaraj, C.Gnanapriya, “Digital Signal Processing”, McGraw Hill International, 2007.
3. Simon Haykins and Barry Van Veen, “Signals and Systems”, John Wiley & sons Inc.,2004.
4. Robert A.Gabel and Richard A.Roberts, “Signals & Linear Systems”, John Wiley, III edition, 1987.
5. Rodger E.Ziemer, William H.Tranter, D.Ronald Fannin,“Signals &Systems”, Pearson Education, Fourth Edition, 2002.

U15EE402R ELECTRICAL MACHINES- II 2 2 0 3

COURSE OUTCOMES

At the end of the course student should be able to,

1. Illustrate the construction and working of alternators and apply various methods to calculate voltage regulation.
2. Explain the operation and derive the power equations of synchronous motor.
3. Explain the construction and operation of three phase induction motor.
4. Calculate the performance characteristics of induction motor using circle diagram and explain various starting methods and speed control methods of three phase induction motor.
5. Construct the equivalent circuit of single phase induction motor and explain the working of special machines.

UNIT I ALTERNATOR 12

Constructional details – types of rotors – armature windings – terminologies – EMF equation – alternator on load, synchronous reactance – voltage regulation – EMF, MMF and ZPF methods – synchronizing of alternators – synchronizing current and power – change of excitation and mechanical input – Blondel's theory – determination of X_d and X_q using slip test.

UNIT II SYNCHRONOUS MOTOR 12

Principle of operation – starting methods –power flow – effect of change of excitation and load – expression for back EMF – power equations – power/power angle relations –construction of V-curves –hunting – synchronous condenser – Applications.

UNIT III THREE PHASE INDUCTION MOTOR 12

Constructional details– principle of operation – slip and its importance – torque equations – slip-torque characteristics – power and efficiency – equivalent circuit – crawling and cogging – induction generator.

UNIT IV CIRCLE DIAGRAM, STARTERS AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 12

Load test – no load and blocked rotor test – circle diagram – need for starters – types of starters: stator resistance and reactance, rotor resistance, auto-transformer and star-delta starters – speed control – voltage, voltage/frequency, poles and rotor resistance – cascaded connection.

UNIT V SINGLE-PHASE INDUCTION MOTOR AND SPECIALMACHINES 12

Principle of operation – double revolving field theory – types of single phase induction motor – equivalent circuit – performance calculation – no load and blocked rotor test – construction and working principles of reluctance motor, repulsion motor, hysteresis motor, and universal motor – applications.

Lecture: 30, Tutorial: 30, Total: 60Hours

TEXT BOOKS:

1. B.L.Theraja and A.K.Theraja, "A Text Book of Electrical Technology",S.Chand Publisher, Fifth Edition, 2008.
2. D.P.Kothari and I.J.Nagrath, "Electric Machines", Tata McGraw Hill Publishing Company Ltd, Fourth Edition, 2011.

REFERENCES:

1. A.E.Fitzgerald, Charles Kingsley, Stephen.D.Umans, "Electric Machinery", Tata McGraw Hill Publishing Company Ltd, 2003.
2. K.Murugesh Kumar, "Induction & Synchronous Machines", Vikas Publishing House Pvt. Ltd, 2000.

U15EE403RGENERATION, TRANSMISSION AND DISTRIBUTION SYSTEMS 2 2 0 3

COURSE OUTCOMES:

At the end of the course student should be able to,

1. Explain the structure of power system and operation of power plants using different sources of electrical energy.
2. Develop expressions for the computation of various transmission line parameters and its application in various networks.
3. Analyse the types of transmission lines by calculating the transmission line efficiency, regulation and sag.
4. Analyse the voltage distribution in insulator strings, its improvement and also the various parameter in underground cables.
5. Explain the operation of various distribution systems and the principle of operation of various FACTS devices.

UNIT I POWER GENERATION SYSTEMS 10

Sources of electric energy – structure of electric power system – load characteristics – load curve, load duration curve, important terms and factors – types of loads – selection of generating units – base load and peak load on station (related problems in load characteristics) introduction to interconnected grid and smart grid system – economic aspects – calculation of cost of electrical energy.

Power plants: construction and working principle of steam, hydroelectric, nuclear, solar and wind power plants.

UNIT II TRANSMISSION LINE PARAMETERS 14

Transmission line conductors – solid, stranded and bundled conductors – parameters of single and three-phase transmission lines – resistance of a transmission line – flux linkage – inductance calculation, single phase two-wire, three-phase symmetrical and unsymmetrical space (single and double circuits) – transposition of transmission line conductors – concept of self-GMD and mutual–GMD (single and group of conductors), applications – electric potential – capacitance calculation, single phase two-wire, three-phase symmetrical and unsymmetrical spacing – skin and proximity effects –interference with neighbouring communication circuits.

UNIT III ANALYSIS OF TRANSMISSION LINES 13

Classification of overhead lines: important terms, calculation of transmission efficiency and voltage regulation of short line, medium line (end condenser, nominal T, nominal π method) and long line (rigorous method) – equivalent circuits **–** calculation of ABCD constants – Ferranti effect and corona loss – calculation of sag and tension (equal, unequal supports and effect of wind and ice).

UNIT IV INSULATORS AND CABLES 12

Main components of overhead lines – conductor materials – line supports.

Insulators: properties and types of insulators – Voltage distribution in insulator string – calculation of string efficiency – improvement of string efficiency.

Underground cables: classification of cable – constructional features of LT and HT cables – calculation of capacitance and dielectric stress of a single core cable – grading of cables – thermal resistance of cable.

UNIT V DISTRIBUTION SYSTEM & FACTS TECHNOLOGY 11

Distribution system: feeders, distributor and service mains – radial, ring-main and interconnected system – AC distribution, primary and secondary distribution – DC distribution 2 wire and 3 wire DC distribution – AC distribution and DC distribution comparison.

FACTS: principle of operation of SVC, TCSC, STATCOM, UPFC – merits & demerits of FACTS technology.

Lecture: 30; Tutorial: 30; TOTAL: 60 Hours

TEXT BOOKS:

1. V.K.Mehta and Rohit Mehta, “Principles of Power System”, S.Chand Publishers, Reprint Edition, 2006.
2. S.N. Singh, “Electric Power Generation, Transmission and Distribution”, Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

REFERENCES:

1. M.L. Soni, Gupta, Bhatnagar, Chakrabarthy, “A Text book on Power Systems Engineering”, Dhanpat Rai & Sons, 2007.
2. B.R. Gupta, “Generation of Electrical Energy”, S.Chand company Ltd., 2009.
3. Wadhwa, C.L., ‘Electrical Power Systems’, John Wiley and sons Ltd., 2009.

U15EE404R MEASUREMENTS AND INSTRUMENTATION 3 0 0 3

COURSE OUTCOMES:

At the end of the course student should be able to,

1. Discuss the static and dynamic characteristics and define various errors.
2. Derive torque equation for different types of meters.
3. Calculate R, L, and C using bridges.
4. Explain storage and display devices.
5. Discuss the types of transducers.

UNIT I INTRODUCTION 9

Functional elements of an instrument – static characteristics: true value, static error, static correction, reproducibility, drift, repeatability, noise, signal to noise ratio, accuracy and precision, sensitivity, linearity, threshold, dead zone, resolution. Dynamic characteristics: speed of response, fidelity, lag, dynamic error – errors: gross error, systematic error and random error – statistical evaluation of measurement data – standards and calibration.

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS 9

Principle and operation of analog voltmeters and ammeters: moving iron: attraction and repulsion type instruments. Moving coil instruments; PMMC, dynamometer type, torque equation – single phase dynamometer type watt meter: toque expression, errors – single phase induction type energy meters – measurement of power using instrument transformers – single phase electro-dynamometer power factor meters and Weston frequency meter.

UNIT III BRIDGES & INTERFERENCE TECHNIQUES 9

DC bridges: Wheatstone bridge, Kelvin double bridge, Megger – AC bridges: Maxwell's, Anderson, Schering, Wien - interference & screening – multiple earths and earth loops - electrostatic and electromagnetic interference – grounding techniques.

UNIT IV DIGITAL INSTRUMENTS AND DISPLAY DEVICES 9

Digital voltmeter: ramp, integrating and successive approximation – digital multi-meter – CRT display, dot matrix display, LED and LCDdisplay, digital energy meter, Digital Storage Oscilloscope (DSO) – digital printers and plotters – recorders: X-Y graphic recorders.

Special instruments: measurement of wind velocity and solar radiation, power quality analyser.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – selection of transducers – resistive, capacitive and inductive transducers – measurement of temperature – RTD, thermistors and thermocouples – piezoelectric transducers – digital transducers – optical encoders – elements of data acquisition system – A/D, D/A converters.

Lecture: 45; Tutorial: 0; Total: 45Hours

TEXT BOOKS:

1. A.K.Sawhney, "A Course in Electrical & Electronic Measurements &Instrumentation", DhanpatRai and Co, 2012.
2. R.K.Rajput, "Electrical Measurements and Measuring Instruments",S.Chand and Company Pvt. Ltd., Second Edition, 2013.

REFERENCES:

1. E.O.Doebelin, "Measurement Systems – Application and Design", Tata McGraw Hill Publishing company, 2003.
2. A.J. Bouwens, "Digital Instrumentation", Tata McGraw Hill, 1997.
3. D.V.S. Moorthy, "Transducers and Instrumentation", Prentice Hall of India Pvt Ltd, 2007.
4. H.S. Kalsi, "Electronic Instrumentation", Tata McGraw Hill, II Edition, 2004.
5. J. B. Gupta, "A Course in Electronic and Electrical Measurements", S. K. Kataria&Sons,Delhi, 2003.

U15EE405R CONTROL SYSTEMS 2 2 0 3

COURSE OUTCOMES:

At the end of the course student should be able to,

1. Derive the transfer function of a given system using mathematical models.
2. Determine the time response of systems and analyse the steady state error.
3. Calculate the frequency domain specifications using frequency response plots.
4. Determine and analyse the stability of given system.
5. Solve the state equations using state space model and obtain the controllability and observability of the given system.

UNIT I BASIC CONCEPTS AND SYSTEM REPRESENTATION 12

Introduction – types of control systems-linear –non-linear – continuous discrete – open loop and closed loop systems – mathematical model of control systems – transfer functions – mechanical translational system – mechanical rotational systems – electrical analogous of mechanical systems – transfer function of field controlled DC motor – block diagram algebra – signal flow graph –Mason's gain formula – transfer function of armature controlled DC motor.

UNIT II TIME RESPONSE ANALYSIS 12

Time response – standard test signals – type and order of control system – time response of first order system for unit step, unit ramp and impulse input – time response of second order system for unit step input – time domain specifications – steady state error and static error constants – generalized error coefficients – correlation between static and dynamic error coefficients – controllers: P, PI and PID – Tuning methods.

UNIT III FREQUENCY RESPONSE ANALYSIS 12

Frequency response – frequency domain specifications – correlation between time and frequency response – frequency response plots – polar plot – bode plot – M and N Circles – Nichol's Chart.

UNIT IV STABILITY ANALYSIS 12

The concepts of stability – necessary conditions for stability –relative stability - Routh Hurwitz stability criterion – root locus – effect of addition of poles – effect of addition of zeros –Nyquist stability criterion.

UNIT V COMPENSATORS AND STATE SPACE ANALYSIS 12

Compensators: introduction – types – lag, lead and lag-lead (qualitative treatment only).

State space analysis: concepts of state, state variables and state model for linear continuous time systems – state space representation using physical variable and phase variable method – solution of state equation using Laplace transform method – controllability and observability.

Lecture: 30; Tutorial: 30; Total: 60Hours

TEXT BOOKS:

1. I.J.Nagrath and M.Gopal, "Control Systems Engineering", 5th Edition, New Age International (P) Ltd,Publishers, 2006.
2. Samarajit Gosh, "Control Systems Theory and Applications", Second edition, Pearson publications, 2012.

REFERENCES:

1. M.Gopal, "Control Systems, Principles and Design", Fourth Edition, Tata McGraw Hill, New Delhi, 2012.
2. A.Nagoorkani, "Control Systems Engineering", First edition, RBA Publications, 2010.
3. S.Palani, "Control Systems Engineering", Second Edition, Tata McGraw Hill,2010.

U15EE406R DIGITAL LOGIC CIRCUITS 2 2 0 3

COURSE OUTCOMES:

At the end of the course student should be able to,

1. Discuss the different number systems, error correcting codes and implement Boolean functions using logic gates.
2. Design and analyse the combinational logic circuits.
3. Design and analyse synchronous sequential circuits using flip flops
4. Analyse asynchronous sequential circuits using logic gates and discuss the concept of VHDL.
5. Design and implement various logic functions using ROM, PLA and PAL.

UNIT I BINARY SYSTEMS AND BOOLEAN ALGEBRA 12

Number systems, Base conversion – Binary arithmetic, 1's and 2's complement – Binary codes – BCD, Gray, Excess-3, Alphanumeric codes – Code conversion – Error detecting and correcting codes – Logic gates – Boolean laws and theorems – Switching functions, SOP and POS form – Simplification using K-map and Quine McCluskey method – Realization of circuits using logic gates.

UNIT II COMBINATIONAL CIRCUITS 12

Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and de-multiplexers.Implementation of combinational logic circuits using decoder, multiplexer and de-multiplexers.

UNIT III DESIGN OF SYNCHRONOUS SEQUENTIAL CIRCUITS 12

Flip flops – SR,JK, D and T. Analysis of synchronous sequential circuits – Design of synchronous sequential circuits –Moore and Mealy circuits – Counters – Shift registers.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITSAND VHDL 12

Asynchronous sequential circuits: Analysis of asynchronous sequential machines – State, state diagram, state table, state assignment, and state reduction –Asynchronous design – Hazards.

VHDL: Digital design process flow – Entities and architecture – Concurrent statements – Sequential statements – Behavioural, data flow and structure modelling – Simple VHDL coding.

UNIT V MEMORIES AND PLDs 12

Classification of memories – Random Access Memory (RAM) – Read Only Memory (ROM) – Memory decoding – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of logic functions with ROM, PLA and PAL.

Lecture: 30; Tutorial: 30; Total: 60Hours

TEXT BOOKS:

1. M. Morris Mano, Michael D Cileti, "Digital Design: With an Introduction to Verilog HDL", Pearson Education, 5th edition, 2013.
2. D. P. Kothari, J. S. Dhillon, "Digital Circuits and Design", Pearson, 2016.

REFERENCES:

1. Charles H. Roth, Jr., Lizy Kurian John, "Digital System Design using VHDL", Cengage, 3rd Edition, 2013.
2. A.Anand Kumar, "Fundamentals of Digital Circuits", PHI India, 4th edition, 2016.
3. Donald D. Givone, "Digital Principles and Design", McGraw Hill Education, 2016.

U15EE407R CONTROL AND INSTRUMENTATION LABORATORY 0 0 4 2

COURSE OUTCOMES:

At the end of the course student should be able to,

1. Derive and determine the transfer functions of electromechanical system.
2. Calculate the unknown values of Resistance, Inductance and Capacitance in given circuit.
3. Determine the response and stability of linear system.

LIST OF EXPERIMENTS:

1. Determination of transfer functions of DC Motor.
2. Determination of transfer functions of AC Servomotor.
3. Analog simulation of type-0 and type-1 system.
4. Determination of transfer functions of DC Generator.
5. Digital simulation of first order systems and second order systems using MATLAB.
6. Stability analysis of linear systems using MATLAB.
7. Design of controllers using MATLAB.
8. Determine the characteristics of displacement and pressure transducers.
9. Measurement of inductance and capacitance.
10. Measurement of low and medium value of resistance.
11. Analog to digital converter and digital to analog converter.
12. Calibration of current transformer and single-phase energy meter.

Total: 60 Hours

U15EE408R ELECTRICAL MACHINES LABORATORY – II 0 0 4 2

COURSE OUTCOMES:

At the end of the course student should be able to,

1. Determine the regulation of three-phase alternator using EMF, MMF, ZPF, slip test, inductive and capacitive load methods.
2. Analyse the V and inverted V curves of three-phase synchronous motor.
3. Draw the performance characteristics and equivalent circuit of single-phase and three-phase induction motor.

LIST OF EXPERIMENTS:

1. Determine the regulation of three-phase alternator by EMF and MMF methods.
2. Determine the regulation of three-phase alternator by ZPF method.
3. Determine the regulation of three-phase salient pole alternator by slip test.
4. Synchronize two alternators by Synchronization method.
5. Draw the V and inverted V curves of three-phase synchronous motor.
6. Comparison of performance quantities of three-phase squirrel cage and slip ring induction motors.
7. Draw the equivalent circuit of a three-phase induction motor by indirect testing method.
8. Pre-determination of performance from circle diagram of a three-phase induction motor.
9. Determination of starting current of a three-phase induction motor with different types of starters.
10. Draw theequivalent circuit of single-phase induction motor.
11. Determine the performance calculation of three-phase alternator.
12. Determine the regulation of three-phase alternator using inductive load.
13. Determine the regulation of three-phase alternator using capacitive load.

Total: 60 Hours

Semester – IV	U15GE401R: SOFT SKILLS AND APTITUDE -II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I* in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate verbal aptitude with regard to given topics and score 65-70% marks in placement specific internal tests

1.Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2.Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Number system b. H.C.F and L.C.M c. Averages d. Percentages e. Ratio and Proportion f. Problems on Ages g. Partnership h. Allegation and Mixture i. Profit and Loss j. Time and Distance k. Problems on Trains l. Permutation and Combination m. Probability n. Time and Work o. Pipes and Cisterns p. Clocks q. Blood Relations r. Seating Arrangement s. Symbols and Series t. Syllogism u. Direction Sense v. Coding and Decoding w. Cubes and Dice x. Arithmetic Reasoning y. Company specific aptitude questions

3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Synonyms b. Antonyms c. Verbal analogy d. Editing passages e. Sentence filler words (one and two) f. Jumbled sentences g. Reconstruction of sentences (PQRS) h. Idioms and phrases i. Spotting errors j. Writing captions for given pictures k. Tenses l. Prepositions m. Reading comprehension n. Choosing the correct / incorrect sentences o. Describing given pictures p. Critical reasoning q. Theme detection r. Articles s. Cloze test t. Company specific aptitude questions

* SSA-I is Soft Skills and Aptitude – I

Sona College of Technology, Salem

(An Autonomous Institution)

Courses of Study for B.E/B.Tech. Semester IV under Regulations 2015R (CBCS)

Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15MAT401CR	Probability and Stochastic Processes	3	2	0	4
2	U15EC401R	Engineering Electromagnetics	3	2	0	4
3	U15EC402R	Electronic Circuits	3	0	0	3
4	U15EC403R	Linear Integrated Circuits	3	0	0	3
5	U15EC404R	Digital Signal Processing	3	2	0	4
6	U15EC405R	Analog Communication Systems	3	0	0	3
Practical						
7	U15EC406R	Linear Integrated Circuits Laboratory	0	0	2	1
8	U15EC407R	Electronic Circuits and Simulation Laboratory	0	0	2	1
9	U15EC408R	Digital Signal Processing Laboratory	0	0	2	1
10	U15GE401R	Soft Skills and Aptitude - II	0	0	2	1
					Total Credits	**25**

Approved By

Chairman, Electronics and Communication Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.S.Sabeenian	Dr.R.Shivakumar	Dr. M.Usha

Copy to:-
HOD/Electronics and Communication Engineering, Fourth Semester BE ECE Students and Staff, COE

U15MAT401CR	PROBABILITY AND STOCHASTIC PROCESSES	L T P C 3 2 0 4

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Work out problems on random variables and distinguish between random and stochastic processes.
2. Model communication system as a stochastic process.
3. Characterize LTI systems driven by a stationary random process using autocorrelation and power spectral density functions.
4. Measure and analyze correlation functions and distribution functions.
5. Analyze the probability distribution functions of noise in a communication link.

UNIT I	**RANDOM VARIABLE** Random Variable Concept – Distribution Function – Density Function – Gaussian Random Variable – Other Distributions-Binomial-Poisson-Uniform-Exponential and Density Examples – Conditional Distribution and Density Functions – Expectation – Moments – Functions That Give Moments-Moment Generating Function only – Transformations of a Random Variable.	**15**
UNIT II	**MULTIPLE RANDOM VARIABLES** Vector Random Variables – Joint Distribution and its Properties – Conditional Distribution and Density – Statistical Independence – Distribution and Density of a Sum of Random Variables – Central Limit Theorem-equal and unequal distributions statement only – Expected Value of a Function of Random Variables – Jointly Gaussian Random Variables – Transformation of Two Dimensional Random Variables.	**15**
UNIT III	**RANDOM PROCESSES –TEMPORAL CHARACTERISTICS** Random Process Concept – Stationarity and Independence – Correlation Functions – Measurement of Correlation Functions – Gaussian Random Processes – Poisson Random Process.	**15**
UNIT IV	**RANDOM PROCESSES –SPECTRAL CHARACTERISTIC** Power Density Spectrum and its Properties – Relationship Between Power Spectrum and Autocorrelation Function – Cross-Power Density Spectrum and its Properties – Relationship between Cross-Power Spectrum and Cross-Correlation Function – Power Spectrums for Discrete-Time Processes and Sequences – White Noise Definition.	**15**
UNIT V	**LINEAR SYSTEMS WITH RANDOM INPUTS** Linear System Fundamentals – Random Signal Response of Linear Systems – System Evaluation Using Random Noise – Spectral Characteristics of System Response.	**15**
	Total	**75**

TEXT BOOKS

1. Peebles Jr. P. Z., "*Probability Random Variables and Random Signal Principles*", Tata McGraw-Hill Publishers, New Delhi, 4th Edition, 37th Reprint Edition, 2016.
2. Veerarajan. T., "Probabilitiy, Statistics and Random process", Tata McGraw-Hill Publications, Second Edition, New Delhi, 2002.

REFERENCE BOOKS

1. A. Papoulis, "*Probability, Random variables and Stochastic Processes",* McGraw Hill, 4th Edition, 2002.
2. John J. Shynk, "*Probability, Random Variables, and Random Processes: Theory and Signal Processing Applications*", John Wiley, 2012.
3. Roy D. Yates and David J. Goodman, "*Probability and stochastic processes*", John Wiley, 1999.
4. Miller S. L. and Childers S. L., "*Probability and Random Processes with applications to Signal Processing and Communications*", Elsevier Inc., First Indian Reprint 2007.

U15EC401R	ENGINEERING ELECTROMAGNETICS	L T P C 3 2 0 4

COURSE OUTCOMES

At the end of each unit, the students will be able to

1. Apply vector calculus to solve static electric and magnetic field problems for different engineering applications.
2. Solve Maxwell's equations using vector calculus by using three standard coordinate systems.
3. Analyze electromagnetic wave propagation in guiding media under various matching conditions.
4. Analyze and compute the power flow mechanisms in bounded and unbounded medium.
5. Deduce EM wave propagation in free space and dielectric medium.

UNIT I	**INTRODUCTION TO ELECTROSTATICS** Scalars and Vectors – Vector Algebra – Rectangular Co-ordinate System – Vector Components and Unit Vector – Vector Field – Circular Cylindrical Coordinate System – Spherical Coordinate System – Conversion of Coordinates from One System to Other System – The experimental law of Coulomb – Electric Field Intensity – Field due to a Continuous line-Surface and Volume Charge Distribution – Field of a Line Charge-Finite-Infinite – Field of a Infinite Sheet of Charge – Electric Flux Density – Gauss Law – Applications of Gauss's Law – Divergence – The Vector Operator and The Divergence Theorem.	**15**
UNIT II	**ELECTROSTATIC POTENTIAL AND DIELECTRICS** Energy Expended in Moving a Point Charge in an Electric Field – Line Integral – Definition of Potential Difference and Potential – Potential Field of a Point Charge – Potential Gradient – The Dipole – Boundary Conditions for Perfect Dielectric Material – Capacitance – Examples of Capacitance – Capacitance of Two Wire Lines – Derivation of Poisson's and Laplace's Equations – Examples of Poisson's and Laplace's	**15**
UNIT III	**STEADY MAGNETIC FIELD AND ITS FORCES** The Biot-Savart Law – Ampere's Circuital Law – Curl – Stokes Theorem – Magnetic Flux and Magnetic Flux Density – The Scalar and Vector Magnetic Potential – Force on a Moving Charge (Lorentz Force Equation) – Force on a Differential Current Element – Force Between Differential Current Element – Force and Torque on a Closed Circuit.	**15**
UNIT IV	**TIME VARYING FIELDS AND PLANE WAVE** Faraday's Law – Displacement Current – Maxwell's Equation in Point Form – Maxwell's Equation in Integral Form – Wave Propagation in Free Space – Wave Propagation in Dielectric – Poynting's Theorem and Wave Power – Propagation in Good Conductors-Skin Effects – Wave Polarization	**15**
UNIT V	**ELECTROMAGNETIC WAVE REFLECTION** Reflection of Uniform Plane Waves at Normal Incidents – Definition of Standing Wave Ratio – Wave Reflection from Multi-interfaces– Plane Wave Reflection at Oblique Incidence Angles – Total Reflection and Total Transmission of Obliquely Incident Waves Horizontal and Vertical polarization-Brewster's Angle.	**15**
	Total	**75**

TEXT BOOK

1. W. H. Hayt and J. A. Buck, "*Engineering Electromagnetics*", TATA McGraw-Hill, 8th Edition, 2014.

REFERENCE BOOKS

1. Matthew N. O. Sadiku and S. V. Kulkarani, "*Principles of Electromagnetics*", 6th Edition Oxford University Press, 2015
2. John D. Kraus and Daniel A. Fleisch, "*Electromagnetics with Applications*", 5th Edition, McGraw Hill InternationalEditon, 1999.
3. E. C. Jordan and K. G. Balmain, "*Electromagnetic waves and Radiating Systems*", Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1968.

U15EC402R	ELECTRONIC CIRCUITS	L T P C 3 0 0 3

COURSE OUTCOMES

At the end of each unit, the students will be able to

1. Analyze and design multistage amplifiers with given conditions.
2. Describe and analyze negative feedback amplifier circuits.
3. Design and analyze stability and different types of oscillator circuits.
4. Design and analyze different types of waveshaping and multivibrator circuits
5. Describe and analyze the operation of power circuits and systems.

UNIT I	**MULTISTAGE AMPLIFIERS** Classification of Amplifiers – Distortion in Amplifiers – Frequency Response of an Amplifier – Bode Plots – Step Response of an Amplifier – Bandpass of Cascaded Stages – RC Coupled Amplifier – Low Frequency Response of RC Coupled Stage – Effect of an Emitter Bypass Capacitor on Low Frequency Response – High Frequency Response of Two Cascaded CE Transistor Stages – Multistage CE Amplifier Cascade at High Frequencies – Noise – Differential Amplifier.	**9**
UNIT II	**FEEDBACK AMPLIFIERS** Classification of Feedback Amplifiers – Feedback Concept – Transfer Gain with Feedback – General Characteristics of Negative Feedback Amplifiers – Input Resistance – Output Resistance – Effect of Feedback on Amplifier Bandwidth- Method of Analysis of Feedback Amplifier – Voltage Series Feedback – Voltage Series Feedback Pair – Current Series Feedback – Current Shunt Feedback – Voltage Shunt Feedback — Nyquist Criterion for Stability of Feedback Amplifiers.	**9**
UNIT III	**STABILITY AND OSCILLATORS** Stability – Gain and Phase Margins – Compensation – Dominant Pole Compensation – Pole Zero-Lead-Lag Compensation – Compensation by Modification of the β Network – Sinusoidal Oscillators – Phase Shift Oscillator – Resonant Circuit Oscillator – General Form of Oscillator Circuit – Wien Bridge Oscillators – Crystal Oscillators – Frequency Stability.	**9**
UNIT IV	**WAVE SHAPING AND MULTIVIBRATOR CIRCUITS** Integrator and Differentiator Circuits – Diode Clippers – Clampers and Slicers – Collector Coupled and Emitter Coupled – Astable Multivibrator – Monostable Multivibrator – Bistable Multivibrator – Triggering Methods – Schmitt Trigger Circuit.	**9**
UNIT V	**POWER CIRCUITS AND SYSTEMS** Class Large Signal Amplifiers – Second Harmonic Distortion – Higher Order Harmonic Generation – Transformer Coupled Audio Power Amplifier – Efficiency – Push-Pull Amplifiers – Class B Amplifiers – Class AB Operation – Regulated Power Supplies – Series Voltage Regulator – Monolithic Regulators – Four Layer Diode – p-n-p-n Characteristics – Silicon Controlled Rectifier.	**9**
	Total	**45**

TEXT BOOK

1. J. Millman and Halkias, "*Integrated Electronics- Analog and Digital Circuits and Systems*", Tata McGraw Hill, 2nd Edition, 2010

REFERENCE BOOKS

1. Sanjay Sharma, "*Electronic Principles*"- S. K. Kataria and Sons, 3rd Edition, 2014.
2. J. Millman and A. Grabel, "*Micro Electronics*", 2nd Edition, 2009.
3. A. S. Sedra and K.C. Smith, "*Micro Electronic Circuits*", Oxford Press, 4th Edition, 1998..

U15EC403R	LINEAR INTEGRATED CIRCUITS	L T P C 3 0 0 3

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Analyze and understand the fundamental operations of Analog ICs.
2. Design analog circuits using Op-Amps.
3. Analyze and describe the working of signal generators.
4. Explain the working of Voltage Reference and Regulator circuits.
5. Analyze the operation of analog to digital and digital to analog converters.

UNIT I	**OPERATIONAL AMPLIFIER FUNDAMENTALS AND APPLICATIONS** Amplifier Fundamentals – The Operational Amplifier – Ideal Op Amp – Basic Op Amp Configurations – Non inverting Amplifier – Voltage follower – Inverting Amplifier – Ideal Op Amp circuit Analysis – Summing Amplifier – Difference Amplifier – Differentiator – Integrator– Negative Feedback – Feedback in Op Amp circuits – The Loop Gain – Circuits with Resistive Feedback – Current to Voltage Converters – Voltage to Current Converters – Differential Amplifiers-Instrumentation Amplifiers	**9**
UNIT II	**STATIC AND DYNAMIC OP AMP LIMITATIONS.** Simplified Op Amp Circuit Diagram – Constant Current Source-Current Mirror –Widlar Current Source–Wilson Current Source– Input Bias and Offset Currents – Input Offset Voltage–Input Offset Error Compensation – Open loop response – Closed Loop Response – Input and output Impedances – Internal Frequency Compensation– External Frequency Compensation. Active filters – The Transfer Function – First-Order Active Filters – Standard	**9**
UNIT III	**OPAMP NONLINEAR CIRCUITS AND SIGNAL GENERATORS.** Voltage Comparators – Comparator Applications – Schmitt Trigger – Precision Rectifiers – Analog Switches – Peak Detectors – Sample-and-Hold Amplifiers – Log / Antilog Amplifiers – Signal Generators – Sine Wave Generators – Multivibrators – Astable Multivibrators – Monostable Multivibrators – Monolithic Timers(555) – 555 Timer as an Astable Multivibrator – 555 Timer as an Monostable Multivibrator – Triangular Wave	**9**
UNIT IV	**VOLTAGE REFERENCES, REGULATORS AND ANALOG MULTIPLIERS.** Performance Specifications – Voltage References – Band Gap Voltage References – Voltage Reference Applications – Linear Regulators – Protections – Monolithic Voltage Regulators – Linear Regulator Applications – Switching Regulators – Basic Topologies – Efficiency – Monolithic Switching Regulator – Voltage Mode Control – Current Mode Control – Analog Multiplier – Variable Transconductance Multiplier.	**9**
UNIT V	**D-A AND A-D CONVERTERS, PHASE LOCKED LOOP.** Performance Specifications – D-A Conversion Techniques – Weighted Resistor DACs – R-2R Ladders – Current Mode R-2R Ladder – Voltage Mode R-2R Ladder – Multiplying DAC Applications – A-D Conversion Techniques – Successive Approximation Converters – Flash Converters – Integrating Type Converters – Over Sampling Converters – Phase Locked Loop – Monolithic PLL	**9**
	Total	**45**

TEXT BOOKS

1. Sergio Franco –"*Design with Operational Amplifiers and Analog Integrated Circuits*"-Tata Mc Graw –Hill, -3rd Edition,2002.
2. D.Roy Choudhry,Shail jain –"*Linear Integrated circuits*"-New age Pub,4th Edition,2010.

REFERENCE BOOKS

1. S.Salivahanan and V.S.Kanchana Bhaskaran-"*Linear Integrated circuits* "-Tata Mc Graw –Hill -2rd Edition.
2. Ramakant A.Gayakwad,"*Op-Amp and Linear ICs*"- Prentice Hall/Pearson Education-4th Edition.
3. Gray and Meyer-"*Analysis and Design of Analog integrated circuits*", Wiley international ,2005

U15EC404R	DIGITAL SIGNAL PROCESSING	L T P C 3 2 0 4

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Explain the properties of discrete Fourier transforms and implement DFT using fast Fourier transform.
2. Design and realize FIR digital filters.
3. Design and realize IIR digital filters.
4. Analyze the finite word length effects in signal processing & Multirate signal processing.
5. Describe the fundamentals of digital signal processors

UNIT I	**DISCRETE FOURIER TRANSFORM AND FFT** Introduction to DFT – Efficient Computation of DFT- Properties of DFT – FFT Algorithms – Radix-2 FFT Algorithms – Decimation in Time – Decimation in Frequency Algorithms – Fast Convolution - Overlap Save Method and Overlap Add Method.	**15**
UNIT II	**FINITE IMPULSE RESPONSE DIGITAL FILTERS** Amplitude and Phase Responses of FIR Filters – Linear Phase Filters – Windowing Techniques for Design of Linear Phase FIR filters-Rectangular- Hamming- Hanning and Blackman Windows - Gibbs Phenomenon – Principle of Frequency Sampling Technique – Realization of FIR Filters-Linear and Cascade Form.	**15**
UNIT III	**INFINITE IMPULSE RESPONSE DIGITAL FILTERS** Review of Design of Analog Butterworth and Chebychev Filters – Design of IIR Digital Filters using Impulse Invariance Technique – Design of IIR Digital Filters using Bilinear Transformation – Pre Warping – Frequency Transformation in Digital Domain – Realization Cascade and Parallel Form.	**15**
UNIT IV	**FINITE WORD LENGTH EFFECTS and MULTI RATE SIGNAL PROCESSING** Quantization Noise – Derivation for Quantization Noise Power- Comparison – Truncation and Rounding Error – Input Quantization Error-Coefficient Quantization Error – Limit Cycle Oscillations-Dead Band- Overflow Error-Signal Scaling – Multi Rate Signal Processing – Interpolation and Decimation.	**15**
UNIT V	**DIGITAL SIGNAL PROCESSORS** Architectural Features – Von Neumann Architecture – Harvard Architecture – Bus Architecture and Memory – Multiplier – Shifter – MAC Unit – ALU – Addressing Modes – Address Generation Unit – Pipelining – Overview of Instruction Set of TMS320C54XX.	**15**
	Total	**75**

TEXT BOOKS

1. John G Proakis- Dimtris G Manolakis,“ *Digital Signal Processing Principles-Algorithms and Application”*, Pearson/PHI, 4th Edition, 2007
2. B.Venkataramani & M-Bhaskar, “*Digital Signal Processor Architecture- Programming and Application”*, TMH, 2003

REFERENCE BOOKS

1. P.Ramesh Babu, **“***Digital Signal Processing*”, Scitech, 2016.
2. S.K.Mitra, “*Digital Signal Processing- A Computer based approach*”, Tata McGraw-Hill, 2006.
3. S.Salivahanan, A.Vallavaraj, Gnanapriya, “*Digital Signal processing”*, McGraw Hill / TMH, 2015.
4. Allan V.Openheim, Ronald W.Sehafer & John R.Buck, “*Discrete Time Signal Processing”*, second editionPearson, Prentice Hall.

U15EC405R	ANALOG COMMUNICATION SYSTEMS	L T P C 3 0 0 3

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Describe the generation and detection methods of various AM systems.
2. Explain the transmission and demodulation methods of FM systems.
3. Analyze the noise performance of various analog modulation systems
4. Illustrate the effect of noise and their various types.
5. Evaluate the basic information theory with source coding theorem.

UNIT I	**AMPLITUDE MODULATION SYSTEMS** Principles of Amplitude Modulation – Mathematical Expression for Single Tone AM – Power Relations in AM – Types of AM – DSBSC-SSBSC and VSB – Generation and Detection Methods – Comparison of Various AM Systems – AM transmitters - Low Level and High Level Modulation – AM Super-heterodyne Radio Receiver.	**9**
UNIT II	**ANGLE MODULATION SYSTEMS** Phase and Frequency Modulation – Principles of FM – Expression for Single Tone FM – Frequency Analysis of FM – Transmission Bandwidth of FM – NBFM and WBFM Generation Methods – Direct Method and Indirect (Armstrong) Method of FM Generation –FM Demodulators – FM Transmitters and Receivers.	**9**
UNIT III	**NOISE THEORY** Noise – Thermal Noise and Shot Noise – Narrow Band Noise and its Representation using In-Phase and Quadrature Components – Noise Figure and its Expression in Terms of SNR – Overall Noise Figure Calculation for Cascaded Amplifiers – Friss Formula **–** Noise Temperature – Noise Bandwidth – Equivalent Noise Resistance.	**9**
UNIT IV	**PERFORMANCE OF CW MODULATION SYSTEMS** Channel SNR – Output SNR – Figure of Merit – Noise in DSBSC and SSBSC Systems using Coherent Detection – Noise in AM System using Envelope Detection – Noise Performance Analysis in FM System – FM Threshold Effect – Threshold Improvement in Discriminators – Pre-Emphasis and De-Emphasis in FM – Noise Performance Comparison Between CW Modulation Systems.	**9**
UNIT V	**INFORMATION THEORY AND CODING** Amount of Information – Entropy – Information Rate – Source Coding to Increase Average Information Per Bit – Shannon-Fano Coding – Huffman Coding – BEC – BSC – Shannon's Theorem – Channel Capacity – Bandwidth – SNR Trade-Off – Mutual Information.	**9**
	Total	**45**

TEXT BOOKS

1. Simon Haykins, "*Communication Systems"*, John Wiley & Sons, 4th Edition, 2016.
2. R.P. Singh and S.D. Sapre, "*Communication Systems– Analog and Digital*", Tata McGrawHill, 3rd Edition, 2014.

REFERENCE BOOKS

3. Wayne Tomasi, "*Electronic Communication Systems*", 5/e, Pearson Education, 2011.
4. H.Taub, D L Schilling, G Saha, "*Principles of Communication*", 3/e, 2011.
5. Dr. Sanjay Sharma, "*Analog Communication systems*", S.K. Kataria & sons, 6th edition, 2013.

U15EC406R	LINEAR INTEGRATED CIRCUITS LABORATORY	L T P C 0 0 2 1

COURSE OUTCOMES

At the end of each unit, the students will be able to

1. Perform algebraic operations and generate waveforms using Op-amp IC741.
2. Design analog filters using Op-amp IC741, monostable and astable multivibrator using IC555.
3. Analyze voltage regulator using IC723 and design PLL using LM565.

Exp. No.	List of Experiments:
1.	Design of Inverting and Non-Inverting amplifier using Opamp (IC 741)
2.	Design of Integrator and Differentiator using Opamp (IC 741)
3.	Design of Differential amplifier to find CMRR using Opamp (IC 741).
4.	Design of Astable and Monostable multivibrator using Opamp IC 741
5.	Design of Schmitt trigger using Opamp (IC 741)
6.	Design of Low pass and High pass filters using Opamp (IC 741)
7.	Design of Band pass filters using Opamp (IC 741)
8.	Design of RC phase shift and Wein bridge oscillators using Opamp(IC 741)
9.	Design of Monostable and Astable multivibrators using IC 555
10.	Design of high voltage regulator using IC 723.
11.	Design of low voltage regulator using IC 723

Total Hours: 30

U15EC407R	ELECTRONIC CIRCUITS AND SIMULATION LABORATORY	L T P C 0 0 2 1

COURSE OUTCOMES

At the end of each unit, the students will be able to

1	Design negative feedback amplifiers and plot its frequency response.
2	Design different types of oscillators for the given specifications.
3	Simulate oscillators and amplifier using PSPICE.
Exp. No.	**List of Experiments**
1	Design and analyze the frequency response of a two stage BJT amplifier with frequency as an input in the range of 50Hz to 500 KHz and plot the frequency Vs gain graph for the given transistor.
2	Design and analyze the frequency response of a differential amplifier in common mode and differential mode and plot the frequency Vs gain graph for the given pair of transistors.
3	Design and analyze the frequency response of a voltage shunt feedback amplifier and plot the frequency Vs gain graph for the given transistor.
4	Design and analyze the frequency response of a current series feedback amplifier and plot the frequency Vs gain graph for the given transistor.
5	Design the RC phase shift oscillator to oscillate at 1 KHz which gives 600 phase shift at each RC network and plot the output.
6	Design the Wien bridge oscillator to oscillate at 1.5 KHz which gives 00 phase shift and plot the output.
7	Design the LC oscillator (Hartley and Colpitts) to obtain 5 KHz output and plot the graph for the same output.
8	Design Astable, Monostable and Bistable multivibrators.
9	Design and analyze Class A amplifier and plot the output response.
10	Simulate the given circuits using PSPICE and verify the output: i) RC phase shift oscillators ii) Hartley oscillators iii) Colpitt's oscillators iv) Astable, Monostable and Bistable multivibrators v) Characteristics of SCR.

Total Hours: 30

U15EC408R	DIGITAL SIGNAL PROCESSING LABORATORY	L T P C 0 0 2 1

COURSE OUTCOMES

At the end of each experiment, the students will be able to

1. Perform Convolution and generation of signals using MATLAB and TMS320C54 Processor.
2. Analyze sampling theorem and calculation of DFT using MATLAB and TMS320C54 Processor.
3. Design FIR and IIR filters using MATLAB and TMS320C54 processor.

Exp. No.	List of Experiments
	Using MATLAB
1.	Generation of Discrete time signals
2.	Linear and Circular convolution
3.	Auto and Cross Correlation
4.	Sampling and effect of Aliasing
5.	Design of FIR Filters
6.	Design of IIR Filters
7.	DFT and FFT
8.	Up sampling and Down sampling
	Using TMS320C54 Processor
9.	Arithmetic operations
10.	Sampling of input signal and display
11.	Implementation of FIR Filters
12.	Implementation of IIR Filters
13.	Linear convolution
14.	Generation of Signals
15.	Calculation of FFT

Total Hours: 30

Semester – IV	U15GE401R: SOFT SKILLS AND APTITUDE -II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

At the end of the course the student will be able to:

4. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
5. Solve problems of increasing difficulty than those in SSA-I* in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
6. Demonstrate verbal aptitude with regard to given topics and score 65-70% marks in placement specific internal tests

1.Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** h. SWOT i. Goal setting j. Time management k. Stress management l. Interpersonal skills and Intrapersonal skills m. Presentation skills n. Group discussions
2.Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** z. Number system aa. H.C.F and L.C.M bb. Averages cc. Percentages dd. Ratio and Proportion ee. Problems on Ages ff. Partnership gg. Allegation and Mixture hh. Profit and Loss ii. Time and Distance jj. Problems on Trains kk. Permutation and Combination ll. Probability mm. Time and Work nn. Pipes and Cisterns oo. Clocks pp. Blood Relations qq. Seating Arrangement rr. Symbols and Series ss. Syllogism tt. Direction Sense uu. Coding and Decoding vv. Cubes and Dice ww. Arithmetic Reasoning xx. Company specific aptitude questions

3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** u. Synonyms v. Antonyms w. Verbal analogy x. Editing passages y. Sentence filler words (one and two) z. Jumbled sentences aa. Reconstruction of sentences (PQRS) bb. Idioms and phrases cc. Spotting errors dd. Writing captions for given pictures ee. Tenses ff. Prepositions gg. Reading comprehension hh. Choosing the correct / incorrect sentences ii. Describing given pictures jj. Critical reasoning kk. Theme detection ll. Articles mm. Cloze test nn. Company specific aptitude questions

* SSA-I is Soft Skills and Aptitude – I

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2015R (CBCS)
Branch: Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15MAT401BR	Probability and Queuing Theory	3	2	0	4
2	U15CS401R	Design and Analysis of Algorithm	3	2	0	4
3	U15CS402R	Operating Systems	3	0	0	3
4	U15CS403R	Database Management Systems	3	0	0	3
5	U15CS404R	Web Programming	3	0	2	4
Practical						
6	U15CS405R	Operating Systems Laboratory	0	0	4	2
7	U15CS406R	Database Management Systems Laboratory	0	0	4	2
8	U15GE401R	Soft Skills and Aptitude – II	0	0	2	1
					Total Credits	**23**

Approved By

Chairperson, Computer Science and Engineering BoS Dr.M.Usha

Member Secretary, Academic Council Dr.R.Shivakumar

Chairperson, Academic Council & Principal Dr.M.Usha

Copy to:-
HOD/Computer Science and Engineering, Fourth Semester BE CSE Students and Staff, COE

U15MAT401BR PROBABILITY AND QUEUING THEORY 3 2 0 4

COURSE OUTCOMES:

At the end of the course, the student will be able to

- State axioms of probability, explain the concepts, define random variable, and discuss their properties
- Give brief accounts of standard distributions, state the properties and define functions of random variable
- Define and explain two dimensional random variables, explain the concepts covariance, correlation and regression and discuss transformation of random variables
- Classify random processes stating the characteristics and describe stationary, Markov, Poisson and birth- death processes
- Define and explain the queuing models, characteristics and outline the procedure for solving queuing problems

UNIT - I Probability and Random Variable 15

Axioms of probability, conditional probability, total probability, Baye's theorem, random variable, probability mass function, probability density function, properties, moments

UNIT - II Standard Distributions 15

Binomial, Poisson, geometric, uniform, exponential and normal distributions and their properties, functions of a random variable

UNIT - III Two Dimensional Random Variables 15

Joint distributions, marginal and conditional distributions, covariance, correlation and regression, transformation of random variables

UNIT - IV Random Processes and Markov Chains 15

Classification, stationary process, Markov process, Poisson process, birth and death process, Markov chains, transition probabilities

UNIT - V Queueing Theory 15

Markovian models: M/M/1, M/M/C, finite and infinite capacity, M/M/∞ queues, finite source model, M/G/1 queue (steady state solutions only)

Total : 75 hours

TEXT BOOK

1. "Probability and Queueing Theory", by Sonaversity, 2011.

REFERENCES

1. Veerarajan T., "Probability, Statistics and Random Processes", Tata McGraw-Hill, New Delhi, 2nd Edition, 2003
2. Ross S., "A first course in probability", Pearson Education, Delhi, 6th Edition, 2002
3. Medhi J., "Stochastic Processes", New Age Publishers, New Delhi, 1994, (Chapters 2, 3, & 4)
4. Taha H. A., "Operations Research-An Introduction", Pearson Education Edition Asia, Delhi, 7th Edition, 2002

U15CS401R DESIGN AND ANALYSIS OF ALGORITHMS 3 2 0 4

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Analyze the algorithms that are used to solve various problems.
- Generate and solve the recurrences for divide and conquer techniques.
- Solve the problems using greedy and dynamic programming paradigms.
- Design the algorithms for solving the backtracking and transform and conquer methodologies.
- Apply the branch and bound technique to solve various problems.

UNIT – I Fundamentals of Algorithm Analysis 12

Introduction - Problem solving techniques-Analysis framework – Time space tradeoff – Asymptotic notations – Conditional asymptotic notation – Properties of Big-Oh notation – Recurrence equations – Mathematical Analysis of Non-recursive algorithms - Mathematical analysis of recursive Algorithms – Analysis of linear search - Empirical analysis - Algorithm visualization

UNIT - II Brute Force and Divide and Conquer strategies 12

Brute Force: Selection Sort - Bubble Sort – String matching - Exhaustive Search: Travelling Sales- man problem - Divide and Conquer: General Method – Binary Search – Closest-pair problem – Merge Sort- Quick Sort.

UNIT – III Greedy and Dynamic Programming paradigms 12

Greedy Algorithms: General Method – Container Loading – Huffman code – Knapsack problem - Dynamic Programming: General Method – Multistage Graphs – All-Pair shortest path problem : Floyd's algorithm - Optimal binary search trees.

UNIT - IV Backtracking and Transform and Conquer methodologies 12

Backtracking: General Method – N-Queen's problem – Sum of subsets – Graph coloring – Hamiltonian problem. Transform and conquer : Presorting – Gaussian elimination.

UNIT - V Graph and Branch and Bound strategies 12

Graph : Connected Components – Bi-connected components – Branch and Bound: General Method (FIFO and LC) – Job assignment problem - 0/1 Knapsack problem – Introduction to NP-Hard and NP-Completeness.

Tutorial: 15, Total: 60 Hours

TEXT BOOK

1. Anany Levitin "Introduction to the design and Analysis of Algorithms", Pearson Education, Second Edition, 2014.

REFERENCES

1. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", Third Edition, Prentice Hall of India Pvt. Ltd, 2009.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, 1999.
3. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2008.
4. K.S. Easwarakumar, " Object Oriented Data Structures Using C++", Vikas Publication House Pvt Ltd, First Edition, 2000.

U15CS402R OPERATING SYSTEMS 3 0 0 3

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Analyze the different OS structure.
- Apply and evaluate suitable CPU scheduling Algorithms for the given set of processes.
- Describe the functionality of a deadlock free system.
- Evaluate the various memory management techniques.
- Evaluate the effectiveness of a file system
- Analyze the Linux operating system for scheduling, memory management and file system

UNIT I Introduction & Operating System Structures 9

Introduction - Mainframe systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection - System Components –Operating System Services – System Calls – System Programs – System Structure – Virtual Machines – System Design and Implementation.

UNIT II Process Management 9

Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication- Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - Case study – Linux Scheduling.

Unit III Process Synchronization & Deadlocks 9

The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors. System Model – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks. 20

Unit IV Storage Management & File System Interface 9

Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging - Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing - File Concept – Access Methods – Directory Structure – File System Mounting – Protection. Case study – Linux memory management

Unit V File System Implementation & Mass Storage Structure 9

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management - Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management - Case study – Linux file system.

Total: 45 Hours

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, eighth Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2012.

REFERENCES:

1. Harvey M. Deitel, “Operating Systems”, Second Edition, Pearson Education Pvt. Ltd, 2004.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Prentice Hall of India Pvt. Ltd, 2014.
3. William Stallings, “Operating System”, Prentice Hall of India, 4th Edition, 2006.

U15CS403R DATABASE MANAGEMENT SYSTEMS 3 0 0 3

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Demonstrate the need, background, architecture and evolution of database management system and to introduce the concepts of ER model
- Design and develop relational models with an emphasis on how to organize, maintain, retrieve and secure information efficiently and effectively from a RDBMS
- Design and evaluate the normality of a logical data model, and correct any anomalies and identify the requirements of data storage and indexing techniques
- Implement query processing methodologies using various operators
- Design and develop methods for multiple transactions are managed concurrently and recovered efficiently during failures

UNIT -I INTRODUCTION 9

Database and Database Users: Characteristics of database approach, Advantages of using the DBMS Approach, Database Applications.
Database system concepts and architecture: Data models, Schemas, Instance, Three schema architecture and data independence, DBMS languages and interfaces, database system Environment, ER model.

UNIT –II RELATIONAL MODEL 9

Relational data model, relational constraints: Relational model concepts, Relational constraints and Relational data base schema, update operations, basic Relational algebra operations, additional relational operations.
SQL: Data definition and Data type, specifying SQL constraints, Basic queries, insert, delete, update, complex queries, views, assertions and triggers, dynamic SQL.
Database security and Authorization: Security issues, grant/revoke privileges, SQL injections.

UNIT –III RELATIONAL DATABASE DESIGN 9

Functional dependencies and normalization: Functional dependencies, Normal forms: 1NF, 2NF, 3NF, Boyce Codd NF, decomposition, Multivalued dependencies and 4NF, join dependencies and 5NF.

UNIT –IV DATA STORAGE AND QUERY PROCESSING 9

Disk Storage, Basic File Structures, and Hashing: Secondary Storage Devices, RAID, Operations on Files, Heap Files, Sorted Files, Hashing Techniques.
Indexing Structures for Files: Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+-Trees.
Query Processing: Translating SQL Queries into Relational Algebra, Algorithms for External Sorting, Algorithms for SELECT and JOIN Operations, Algorithms for PROJECT and Set Operations.

UNIT –V TRANSACTION MANAGEMENT 9

Transaction Processing: Introduction, Transaction and System Concepts, desirable Properties of Transactions, Schedules based on Recoverability, Schedules based on Serializability.

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control, Timestamp Ordering.

Database Recovery Techniques: Recovery Concepts, Deferred Update, Immediate Update, Shadow Paging, ARIES recovery algorithm.

Total: 45 hours

TEXT BOOK

1. Abraham Silberschatz, Henry F. Korth and Sudarshan. S, "Database System Concepts", Sixth Edition, McGrawHill, 2010

REFERENCES

1. RamezElmasri and ShamkantNavathe, "Fundamentals of Database Systems ", 6th Edition, Addison-Wesley, 2011
2. Raghu Ramakrishnan,"Database Management System", Tata McGraw-Hill Publishing Company, 2003
3. Date. C. J, Kannan. A, Swamynathan. S, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006
4. Rajesh Narang, "Database Management systems", PHI Learningpvt. Ltd, New Delhi,2006

U15CS404R WEB PROGRAMMING 3 0 2 4

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Implement the concepts of java in real time applications
- Design and implement websites using HTML, JavaScript and Cascading style sheets
- Write programs to create multi-tier application using model view controller pattern
- Design and develop real-time web applications using PHP
- Build interactive web services using SOAP

UNIT I JAVA PROGRAMMING 9

Java: overview– Variables and Arrays – Classes – Objects – Methods – Inheritance - Packages – Abstract classes – Interfaces and Inner classes – Exception handling - Introduction to Threads – Multithreading – String handling – Streams and I/O.

UNIT II INTRODUCTION TO THE INTERNET 8

Internet Protocols - TCP/IP, UDP, DNS and Domain Names, Higher-level Protocols, WWW Versions - HTTP - Request and Response Messages - URI, URN, URL, MIME Type. Web Clients: HTML - History - Versions – CSS - XHTML Syntax and Semantics. Web Servers: IIS and Apache - Server Features, Server History, Server Configuration and Tuning, Defining Virtual Hosts, Logging, Access Control, Secure Servers.

UNIT III CLIENT SIDE AND SERVER SIDE PROGRAMMING 11

Java Script: introduction–JavaScript DOM Model-Date and Objects,-Regular Expressions- -Validation-Built-in objects-Event Handling- DHTML with JavaScript. Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server. DATABASE CONNECTIVITY: JDBC perspectives, JDBC Connectivity and programs- Multi tier application.

UNIT IV PHP and XML 8

PHP: introduction - Variables- Program control- Built-in functions-Connecting to Database – Using Cookies-Regular Expressions. XML: Basic XML- Document Type Definition XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation.

UNIT V INTRODUCTION TO AJAX and WEB SERVICES 9

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods. Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application – SOAP.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2012.
2. Herbert Schildt, “Java-The Complete Reference”, Eighth Edition, Mc Graw Hill Professional, 2011.

REFERENCES

1. Robert W. Sebesta, Programming the World Wide Web‖, Eighth Edition, Addison-Wesley, 2015.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Paul Dietel and Harvey Deitel, “Java How to Program”, 8th Edition Prentice Hall of India.
4. Gopalan N.P. and Akilandeswari.J, “Web Technology”, Prentice Hall of India, 2011.
5. https://www.w3schools.com/

U15CS405R OPERATING SYSTEMS LABORATORY 0 0 4 2

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Design, develop and determine the efficiency of CPU scheduling algorithms.
- Design, develop and demonstrate various page replacement policies.
- Demonstrate the schemes of memory management techniques.
- Design and develop an deadlock avoidance algorithm
- Simulate various Unix commands using shell scripts

(Implement the following on LINUX platform. Use C for high level language implementation)

List of Experiments

1. UNIX - Basic Commands.
2. Shell programming (Using looping, control constructs etc.,)
3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.
6. Implementation of CPU scheduling algorithms: FCFS, SJF, Round Robin & Priority Scheduling.
7. Implementation of the Producer – Consumer problem using Semaphores.
8. Implementation of Banker's algorithm.
9. Implementation of memory management schemes (First fit, Best fit & Worst fit)
10. Implement page replacement algorithms (FIFO & LRU)

Total: 45 Hours

U15CS406R DATABASE MANAGEMENT SYSTEMS LABORATORY 0 0 4 2

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Design schema for the given database by creating appropriate tables and write SQL queries using DDL and DML statements to retrieve information out of it.
- Create views and triggers that automatically indicate the updating of data in the tables
- Apply the concept of databases to the real time application development

LIST OF EXPERIMENTS:

1. Create a relational database system using DDL commands with constraints
2. Update the database system using DML commands
3. Query the database using simple and complex queries
4. Create and update views
5. High level programming language extensions (Control structures, Procedures and Functions)
6. Working with triggers
7. Use of front end tools to manipulate the database
8. Menu Design
9. Generate reports using a reporting tool
10. Database Design and implementation of an application system. (Suggested Mini Project)

Total: 60 hours

Semester – IV	U15GE401R: SOFT SKILLS AND APTITUDE -II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I* in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate verbal aptitude with regard to given topics and score 65-70% marks in placement specific internal tests

1.Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2.Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Number system b. H.C.F and L.C.M c. Averages d. Percentages e. Ratio and Proportion f. Problems on Ages g. Partnership h. Allegation and Mixture i. Profit and Loss j. Time and Distance k. Problems on Trains l. Permutation and Combination m. Probability n. Time and Work o. Pipes and Cisterns p. Clocks q. Blood Relations r. Seating Arrangement s. Symbols and Series t. Syllogism u. Direction Sense v. Coding and Decoding w. Cubes and Dice x. Arithmetic Reasoning y. Company specific aptitude questions

3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Synonyms b. Antonyms c. Verbal analogy d. Editing passages e. Sentence filler words (one and two) f. Jumbled sentences g. Reconstruction of sentences (PQRS) h. Idioms and phrases i. Spotting errors j. Writing captions for given pictures k. Tenses l. Prepositions m. Reading comprehension n. Choosing the correct / incorrect sentences o. Describing given pictures p. Critical reasoning q. Theme detection r. Articles s. Cloze test t. Company specific aptitude questions

* SSA-I is Soft Skills and Aptitude – I

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2015R (CBCS)
Branch: Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15MAT401ER	Probability and Statistics	3	2	0	4
2	U15IT401R	Operating Systems	3	0	2	4
3	U15IT402R	Microprocessors and Microcontrollers	3	0	0	3
4	U15IT403R	Design and Analysis of Algorithms	3	0	2	4
5	U15IT404R	Software Engineering	3	0	0	3
6	U15IT405R	Java Programming	3	0	0	3
Practical						
7	U15IT406R	Java Programming Laboratory	0	0	2	1
8	U15IT407R	Microprocessors and Microcontrollers Laboratory	0	0	2	1
9	U15GE401R	Soft Skills and Aptitude - II	0	0	2	1
					Total Credits	**24**

Approved By

Chairperson, Information Technology BoS **Member Secretary, Academic Council** **Chairperson, Academic Council & Principal**
Dr.J.Akilandeswari Dr.R.Shivakumar Dr.M.Usha

Copy to:-
HOD/Information Technology, Fourth Semester BE IT Students and Staff, COE

U15MAT401ER PROBABILITY AND STATISTICS 3 2 0 4

COURSE OUTCOMES

At the end of the course, the student will be able to

1. State axioms of probability, explain the concepts, define random variable, and discuss their properties.
2. Give brief accounts of standard distributions, state the properties and define functions of random variable.
3. Define and explain two dimensional random variables, explain the concepts covariance, correlation and regression and discuss transformation of random variables.
4. Define the sampling distribution, test and analyse the hypothesis for mean, variance, proportions and differences using Normal, t, Chi-Square and F-distributions and also test and analyse the independence of attributes and goodness of fit.
5. Define simple correlation and regression, analyse these measures, define multiple and partial correlation and regression and also analyse these measures.

UNIT - I PROBABILITY AND RANDOM VARIABLE 12

Axioms of probability, conditional probability, total probability, Bayes theorem, random variable, probability mass function, probability density function, properties, Moment generating functions and their properties.

UNIT - II STANDARD DISTRIBUTIONS 12

Binomial, Poisson, geometric, uniform, exponential and normal distributions and their properties, functions of a random variable.

UNIT - III TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions, marginal and conditional distributions, covariance, transformation of random variables, Central limit theorem.

UNIT IV TESTING OF SIGNIFICANCE 12

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT - V CORRELATION AND REGRESSION 12

Correlation (simple and rank correlation) and regression, multiple and partial correlations, partial and multiple regression.

Tutorial: 30 hours Total: 75 hours

TEXT BOOKS

1. "Probability and Statistics", by Sonaversity, 2014.
2. Johnson R.A., and Gupta C.B., "Miller and Freund's, "Probability and Statistics for Engineer's", Pearson Education, Asia, 7th edition, 2007.

REFERENCE BOOKS

1. Veerarajan T., "Probability, Statistics and Random Processes", Tata McGraw-Hill, New Delhi, 2nd edition, 2003.
2. Ross S., "A first course in probability", Pearson Education, Delhi, 6th edition, 2002.

U15IT401R OPERATING SYSTEMS 3 0 2 4

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Explain structures of Operating System.
2. Apply fundamental Operating System abstractions such as processes, process scheduling, Semaphores, IPC abstractions, shared memory regions, deadlock and threads.
3. Explain the principles of concurrency and synchronization, and apply them to write concurrent programs/software.
4. Implement basic resource management techniques (scheduling or time management, space management) and principles.
5. Describe the types of I/O management, disk scheduling, disk management and swap space management.

UNIT I INTRODUCTION 9

Introduction – What Operating System Do – Operating System Structure – Operating system Operations – Operating System Components: Process Management – Memory Management – Storage Management – I/O Management – Network Management - Protection and Security.

Classes of Operating Systems: Mainframe Systems – Single Processor System - Multiprocessor Systems - Desktop Systems — Distributed Systems – Clustered Systems – Real-Time Systems – Handheld Systems - Open Source Operating Systems.

Operating System Structures: Operating System Services – User and Operating System Interface – System Calls – Types of System Calls.

UNIT II PROCESS MANAGEMENT AND THREADING 9

Processes: Process concept – Process scheduling – Operation on Processes - Inter-process Communication: Shared Memory Systems - Message Passing Systems.

Process Scheduling: Basic Concepts – Scheduling Criteria – Scheduling Algorithms: First-Come, First-Served – Priority – Round-Robin – Multilevel Queue – Multilevel Feedback Queue.

Threads: Overview – Multithreading models - Threading issues.

UNIT III PROCESS SYNCHRONIZATION AND DEADLOCKS 9

Process Synchronization: Background - The critical-section problem (Software based solution and hardware based solution) – Semaphores – Classic Problems of Synchronization – Monitors.

Deadlocks: System model - Deadlock Characterization – Methods for Handling Deadlocks -Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlocks.

UNIT IV MEMORY MANAGEMENT 9

Memory Management Strategies: Background – Swapping – Memory allocation: Contiguous Memory Allocation – Non-contiguous Memory Allocation: Segmentation - Paging – Segmentation with Paging - Structure of the Page Table.

Virtual Memory: Background - Demand Paging – Page Replacement – Allocation of Frames – Thrashing.

UNIT V FILE SYSTEM AND STORAGE MANGEMENT 9

File System Interface: File Concept – Access Methods – Directory and Disk Structure – Protection.

File System Implementation: File System Structure – File System Implementation – Directory Implementation - Allocation Methods – Free Space Management.

Mass Storage Structure: Overview of Mass Storage Structure – Disk Structure - Disk Scheduling – Disk Management - Swap Space Management.

Total: 45 hours

TEXT BOOK

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", Ninth Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2015.

REFERENCES

1. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 3rd edition 2007.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, 3rd edition 2009.
3. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall of India, 6th edition, 2009.
4. D M Dhamdhere, "Operating Systems: A Concept-Based Approach",Tata Mc-graw Hill Publishing, 3rd edition, 2012.
5. Charles Crowley, "Operating System: A Design-Oriented Approach", Tata Mc-graw Hill Publishing, 1st edition, 2009.

List of Experiments

1. Basic process management algorithms.
2. Implementing various memory allocation methods.
3. Implementing various page replacement policies.
4. Implementation of disk scheduling algorithms.
5. Explore programming performance in Linux and Windows.

U15IT402R MICROPROCESSORS AND MICROCONTROLLERS 3 0 0 3

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Explain the architecture of 8085 processor and write assembly language Programming using the instruction set of 8085.
2. Explain the architecture of 8086 processor with minimum and maximum mode configuration and write assembly language Programming using the instruction set of 8086.
3. Design memory and I/O interfacing with Microprocessors.
4. Describe multiprocessor configuration and architecture of advanced microprocessors.
5. Describe the architecture of 8051 microcontroller with operational features.

UNIT I 8085 MICROPROCESSOR 9

8085 Microprocessor- Architecture – Signals - Addressing modes - Instruction set - Programming the 8085

UNIT II 8086 MICROPROCESSOR 9

8086 microprocessor –Register organization of 8086- Architecture – Signal description of 8086 – Minimum and maximum mode of 8086 system - Addressing Modes - Instruction Set - Assembly Language Programming - Interrupts and Interrupt Service Routines.

UNIT III INTERFACING WITH MICROPROCESSORS 9

Memory interfacing with Microprocessors – Parallel Communication Interface (8255) – Serial Communication Interface (8251) – Timer (8253) - Keyboard/display controller (8279) – DMA controller (8237).

UNIT IV MULTIPROCESSOR AND ADVANCED MICROPROCESSORS 9

Coprocessor Configuration – Closely Coupled Configuration – Loosely Coupled Configuration –Numeric Data Processor(8087) – Architecture of 8087 – I/O Processor(8089) – Architecture of 8089 – Pentium 4 Processor – Salient features of Pentium 4 Processor- Microarchitecture of Pentium 4 processor – Microarchitecture of I3 Processor.

UNIT V MICROCONTROLLER 9

8051 Microcontroller- Architecture – signals descriptions of 8051– Register set of 8051- Important operational features of 8051- Addressing modes - memory addressing by 8051 – I/O addressing by 8051-interrupts of 8051.

Total: 45 hours

TEXT BOOKS

1. Ramesh S. Gaonkar ,"Microprocessor – Architecture, Programming and Applications with the 8085" Penram International Publisher , 6th Edition, 2013.
2. A.K.Ray& K.M Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", 3rd edition, Tata Mc Graw Hill, 2015.

REFERENCES

1. Douglas V.Hall and SSSP Rao, " Microprocessors and Interfacing", third edition , Tata Mc Graw Hill ,2012.
2. Yn-chengLiu,GlennA.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", second edition, Prentice Hall of India , 2011 .
3. Mohamed Ali Mazidi,JaniceGillispieMazidi," The 8051 microcontroller and embedded systems using Assembly and C", 2nd edition, Pearson education /Prentice hall of India , 2011.
4. Kenneth J.Ayala, "The 8051 microcontroller and Embedded systems using assembly and C", 1st edition, Cengage learning publisher,2010.

U15IT403R DESIGN AND ANALYSIS OF ALGORITHMS 3 0 2 4

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Define algorithm and describe its characteristics.
2. Represent the algorithmic time complexity for recursive and non-recursive algorithms using different asymptotic notations.
3. Apply the algorithmic techniques - Brute Force, Divide and conquer, Decrease and Conquer to different problems and analyze the time complexity.
4. Apply the algorithmic techniques - Transform and conquer, Dynamic Programming and Greedy approach to solve different problems and analyze the time complexity.
5. Explain the algorithm design methods such as backtracking, branch and bound to solve complex problems and characterize the type of problems as NP, NP-Complete and NP-Hard.

UNIT I BASIC CONCEPTS OF ALGORITHMS 8

Introduction – Notion of Algorithm – Fundamentals of Algorithmic Solving – Important Problem types – Analysis Framework – Asymptotic Notations and Basic Efficiency Classes.

UNIT II MATHEMATICAL BACKGROUND AND ANALYSIS OF ALGORITHMS 8

Mathematical Analysis of Non-recursive Algorithm – Mathematical Analysis of Recursive Algorithm – Example: Fibonacci Numbers – Empirical Analysis of Algorithms – Algorithm Visualization.

UNIT III ANALYSIS OF SORTING AND SEARCHING ALGORITHMS 10

Brute Force – Selection Sort and Bubble Sort – Sequential Search and Brute-force string matching – Divide and conquer – Merge sort – Quick Sort – Binary Search – Binary tree Traversal and Related Properties – Decrease and Conquer – Depth first Search and Breadth First Search – Algorithm for generating combinatorial objects.

UNIT IV ALGORITHMIC TECHNIQUES 10

Transform and conquer – Presorting – Balanced Search trees – AVL Trees – Heaps and Heap sort – Dynamic Programming – Warshall's and Floyd's Algorithm – Optimal Binary Search trees – Greedy Techniques – Approximate bin packing algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman trees.

UNIT V ALGORITHM DESIGN METHODS 9

Backtracking – n-Queen's Problem – Hamiltonian Circuit problem – Subset-Sum problem – Branch and bound – Assignment problem – P, NP and NP complete problems – Introduction to approximate algorithms- Approximation algorithms for NP- hard problems -Travelling salesman problem and Knapsack problem.

Practical: **30 hours** **Total : 75 hours**

TEXT BOOK

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, Third edition, 2011.

REFERENCES

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 2001
2. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education Asia, 2003.
3. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms",Pearson Education, 1983.
4. Horowitz and Sahni , "Fundamentals of Computer Algorithms", Galgothia publications.

U15IT404R SOFTWARE ENGINEERING 3 0 0 3

COURSE OUTCOMES

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

1. Identify the scope and requirements of software engineering in IT industry and apply different SDLC models in different applications.
2. Prepare Software Requirements Specification (SRS) document for real time applications.
3. Explain the object-oriented methodologies and workflows and apply object-oriented principles, techniques, appropriate UML models, and other artifacts to construct a design for a real-world problem.
4. Analyze system requirements to determine the use cases and domain model of the problem domain and describe the classification techniques of objects.
5. Explain the different views of software architecture, the key mechanisms that are defined in support of that architecture, and the effect of the architecture and mechanisms on the produced design.

UNIT I SOFTWARE PRODUCT AND PROCESS 9

Introduction: The Nature of Software, Software Process, Process Models - AGeneric Process Model, Prescriptive Process Models - The Waterfall Model, Incremental Model, Evolutionary Process Models, Concurrent Models, Specialized Process Models, The Unified Process, Agile Development- Agility and Cost of Change, Agile process, Scrum.

UNIT II SOFTWARE REQUIREMENTS AND ANALYSIS 9

Software Requirements: Functional and Non-Functional requirements, Requirement Engineering Process- Requirements Engineering, Establishing the Groundwork, Eliciting requirements, Negotiating requirements, Validating requirements, Feasibility Studies, Software Requirement Specification (SRS) Document.

UNIT III METHODOLOGY, MODELING, AND UNIFIED MODELING LANGUAGE 9

Object Oriented Systems Development Life Cycle - **Object Oriented Methodologies:** Rumbaugh Methodology, Booch Methodology, Jacobson Methodology and Unified Approach- Data Dictionary.

Unified Modeling Language: Introduction, static and dynamic model, UML class diagram, Use case diagram, UML dynamic modeling, Interactive Diagram, State Diagram, Activity Diagram, Implementation diagram.

.UNIT IV OBJECT ORIENTED ANALYSIS 9

Identifying use cases, Classification, Identifying Object relationships, Attributes and Methods.

UNIT V SOFTWARE DESIGN AND OBJECT ORIENTED DESIGN 9

Modular Design, Architectural Design, Data Design, User Interface Design, Design axioms, Corollaries, Designing Classes

Total: 45 hours

TEXT BOOKS

1. Roger S. Pressman, "Software Engineering – A practitioner's Approach", 7th Edition, McGraw-Hill International Edition, 2015.
2. Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill, 2008.

REFERENCES

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2010.
2. Watts S.Humphrey, "A Discipline for Software Engineering", Pearson Education, 2007.
3. Martin Fowler, "UML Distilled", Second Edition, PHI/Pearson Education, 2002.
4. Stephen R. Schach, "Introduction to Object Oriented Analysis and Design", Tata McGraw-Hill, 2003.

U15IT405R JAVA PROGRAMMING 3 0 0 3

COURSE OUTCOMES

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

1. Apply basic features of Java to write programs
2. Write programs to handle different type of exceptions
3. Apply collection framework for writing efficient programs for real time applications
4. Apply event handling techniques for interaction with GUI based application.
5. Write multithreaded and data driven application using JDBC.

UNIT I CLASS, METHODS AND STRINGS 9

History and Evolution of Java - An Overview of Java – Data types, variables, and Arrays- Operators – Control Statement – Introducing Class - Methods – String, StringBuffer, StringBuilder

UNIT II INHERITANCE, PACKAGE, INTERFACE AND EXCEPTION ANDLING 9

Inheritance –Packages and Interfaces - Exception Handling Fundamentals – Exception Types – Uncaught Exception – Using try and catch – Multiple catch Clauses – Nested try statement – throw – throws – finally –Built-in Exception- Creating our own Exception class – Chained Exception

UNIT III I/O AND THE COLLECTIONS FRAMEWORK 9

I/O Basics – Exploring java.io: Stream Class, Character Streams – Serialization - The Collections Framework: The ArrayList class – The HashSet class – Working with maps- The Vector class - Accessing a Collection via an Iterator

UNIT IV GUI AND EVENT HANDLING 9

Applet programming – Event Handling – Introducing Swing – Exploring Swing: JLabel and ImageIcon, JTextField, Swing Buttons, JTabbedPane, ,JList, JComboBox, Trees, JTable,JMenuBar, JMenu and JMenuItem

UNIT V THREADS AND DATABASE CONNECTIVITY 9

What Are Threads? - Interrupting Threads - Thread States - Thread Properties – Synchronization – Inter thread communication - JDBC Programming concept – Executing Queries – Scrollable and Updatable Resultset.

Total: 45 Hours

TEXT BOOK

1. Herbert Schildt, "Java™ : The Complete Reference", 9th edition, Oracle Press, 2014.

REFERENCES

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", 9th edition, Prentice Hall, 2013.
2. K. Arnold, D. Holmes and J. Gosling, "The JAVA programming language", 4th edition, Addison Wesley Professional, 2005.
3. Timothy Budd, "Understanding Object-oriented programming with Java", 3rd edition, Addison Wesley, 2000.
4. C. Thomas Wu, "An introduction to Object-oriented programming with Java", 5th edition, Tata McGraw-Hill Publishing company Ltd., 2009.

U15IT406R JAVA PROGRAMMING LABORATORY 0 0 2 1

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Apply the basic features of JAVA such as Control statements, Arrays, Classes, Inheritance, Interface and Packages in solving a problem
2. Apply appropriate IO stream and collection framework for solving real time problem
3. Write multithreaded and GUI based data driven application using JDBC concepts

LIST OF EXPERIMENTS

1. Write theprogramsusingtheconceptofnestedloops, recursion, arrays, Stringand StringBufferclass.
2. Write theprogramsusingtheconceptof Class,Inheritance, Interface and Packages
3. Write aprogramthatusestheI/O package for reading and writing a text file.
4. Write aprogramthatusesthe different exception handling mechanism.
5. Write a program that persistently stores the current state of the object.
6. Write a program that uses different collection class for managing data of different applications.
7. ImplementingaGUI basedonSwings and Frames. Also, write the program to handle GUI based events.
8. Write aprogramthatusestheconceptofApplet.
9. Write theprogramsthatusestheconcept ofThreads.
10. Write a program that uses JDBC API for interacting with the database.

U15IT407R MICROPROCESSORS AND MICROCONTROLLERS LABORATORY 0 0 2 1

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Write ALP programs for arithmetic manipulations using Microprocessors.
2. Interface different I/Os with microprocessors and perform arithmetic manipulations using Microcontroller.
3. Solve real time industry based problems with Microprocessors and Microcontrollers.

LIST OF EXPERIMENTS

1. 8-bit and 16 bit Manipulations- Addition, Subtraction, Multiplication and Division using Microprocessors.
2. Code conversions - BCD to Binary and Binary to BCD using Microprocessors.
3. Decimal Arithmetic and Bit Manipulation using Microprocessors.
4. Double precision – Addition and subtraction using Microprocessors.
5. 8255 Interface -Experiments with mode 0 and mode1 using Microprocessors.
6. 8279 Interface -Keyboard/ Display Interface with Microprocessors.
7. 8253 Interface -Timer Interface with Microprocessors.
8. 8251 Interface -Programmable Communication Interface with Microprocessors.
9. 8-bit and 16 bit Manipulations- Addition, Subtraction and Multiplication using 8051.
10. Array Operations-Sum of N Elements using 8051.
11. Applications – Traffic light controller and stepper motor using Microprocessors and Microcontroller.

Semester – IV	U15GE401R: SOFT SKILLS AND APTITUDE -II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I* in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate verbal aptitude with regard to given topics and score 65-70% marks in placement specific internal tests

1.Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2.Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Number system b. H.C.F and L.C.M c. Averages d. Percentages e. Ratio and Proportion f. Problems on Ages g. Partnership h. Allegation and Mixture i. Profit and Loss j. Time and Distance k. Problems on Trains l. Permutation and Combination m. Probability n. Time and Work o. Pipes and Cisterns p. Clocks q. Blood Relations r. Seating Arrangement s. Symbols and Series t. Syllogism u. Direction Sense v. Coding and Decoding w. Cubes and Dice x. Arithmetic Reasoning y. Company specific aptitude questions

3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Synonyms b. Antonyms c. Verbal analogy d. Editing passages e. Sentence filler words (one and two) f. Jumbled sentences g. Reconstruction of sentences (PQRS) h. Idioms and phrases i. Spotting errors j. Writing captions for given pictures k. Tenses l. Prepositions m. Reading comprehension n. Choosing the correct / incorrect sentences o. Describing given pictures p. Critical reasoning q. Theme detection r. Articles s. Cloze test t. Company specific aptitude questions

* SSA-I is Soft Skills and Aptitude – I

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech.Semester IV under Regulations 2015R (CBCS)
Branch: Fashion Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15FT401R	History of Costumes and Accessories Designing	3	0	2	4
2	U15FT402R	Woven Fabric Manufacture and Structure	3	0	0	3
3	U15FT403R	Knitted Fabric Manufacture and Structure	3	0	0	3
4	U15FT404R	Chemical Processing of Textiles and Garments	3	0	2	4
5	U15FT405R	Garment Construction-I	3	0	0	3
Practical						
6	U15FT406R	Fabric Structure and Textile CAD Laboratory	0	0	2	1
7	U15FT407R	Garment Construction Laboratory – I	0	0	4	2
8	U15ENG401R	Communication Skills Laboratory	0	0	2	1
9	U15FT408R	In-Plant Training	0	0	0	1
10	U15GE401R	Soft Skills and Aptitude – II	0	0	2	1
					Total Credits	**23**

Approved By

Chairman, Fashion Technology BoS Dr.G.Gunasekaran

Member Secretary, Academic Council Dr.R.Shivakumar

Chairperson, Academic Council & Principal Dr.M.Usha

Copy to:-
HOD/Fashion Technology, Fourth Semester BE FT Students and Staff, COE

U15FT401R **HISTORY OF COSTUMES AND ACCESSORIES DESIGNING** **3 0 2 4** **COURSE OBJECTIVE**

To impart knowledge on traditional textiles of India, various styles of costumes prevailing in the ancient civilization and the aesthetic, functional purpose of commonly used garment, leather and ornamental accessories.

COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Describe different types of traditional textiles of India
2. Give an account of the various concepts of fashion designing and the prevailing styles in the costumes of ancient civilizations and overview of costumes of different countries in the world
3. Explain the aesthetic and functional purpose of commonly used garment accessories
4. Discuss key factors in the design of typical leather accessories with regards to their functional and aesthetic requirements
5. Explain the key factors in the design of typical ornamental fashion accessories with regards to their functional and aesthetic requirements
6. Create fashion and garment accessories using various materials

Unit-I Traditional Textiles of India 11

History of embroidery, Hand-woven, Dyed, Printed and painted textiles of India;
Coloured Textiles – Bandhani, Patola, Ikkat, Pocchampalli.
Woven Textiles – Brocades, Jamavar, Paithani, Jamdani, Chanderi, Maheshwari, Kanjivaram, Kota, Baluchari, Dacca Muslin, Himrus and Amrus;
Printed Textiles – Chintz, Sanganeri;
Painted Textiles – Kalamkari; Shawls of Kashmir.

Unit-II Costumes of Ancient Civilization 10

History of Indian costumes – Mughal and post - Mughal periods; Traditional costumes of different states of India; Costumes of ancient civilizations - Egypt, in Greek, Roman, English, **American**, French empires during Renaissance 1500 –1600 AD – Overview of Costumes of Pakistan, SriLanka, Burma, China, and Africa.

Unit-III Garment Accessories 8

Introduction to fashion accessories – Classification of various accessories; Selection of Materials, Design, Functional and aesthetic performance and their advantages - Ribbons, Braids, Laces, Appliqués, Buttons, Zippers, Snap fasteners, Hooks and Eyes, Hook and Loop tape; Eyelets, Neck Tie, Scarves, Stoles, Umbrella, Socks, Stockings, Veils.

Unit-IV Leather Accessories 8

Selection of Materials, Design, Functional and aesthetic performance and their advantages; Various styles of – Footwear, Belts, Gloves, Hand bags, Hats, Wallets, and other personal leather goods.

Unit-V Ornamental Accessories 8

Selection of Materials, Design, purpose, styles and their advantages; Pendants, Waist Bands, Wrist Bands, Necklaces, Head Bands, Bows, Sunglass, Wrist watches, Rings, Ear rings, Bangles, Bracelets and Anklets.

LIST OF EXERCISES

1.**Designing and production of Earrings, bracelets, necklaces, rings and anklet** using materials likecolored papers, buttons, fabric scraps, coloured beads and stones (1 session)

2. **Designing andConstruction of handbag, purse and glove** (2 sessions)

3.**Designing andConstruction of headband, wrist band, cap and Belt** (1 session)

4.**Designing andConstruction of garment accessories using** Ribbons, Braids, Laces, Appliqués (1 session)

Total: 60 hours

TEXTBOOKS

1. Phyllis Tortora, "**Encyclopedia of Fashion Accessories**", Om Books Publication, 2003.
2. RusselGillow, Nicholas Barnard, "**Traditional Indian Textiles**", Thames and Hudson Ltd., London, 1991.

REFERENCE BOOKS

1. RituBhargav, "**Design Ideas and Accessories**" Jain Publications Pvt. Ltd., 2005.
2. VandanaBhenderi, **"Costume, Textiles and Jewellery of India – Traditions in Rajasthan",** Prakash Books, New Delhi, 2004.
3. John Peacock, "**Fashion Accessories – The Complete 20th Century Source Book**", Thames and Hudson Publication, 2000.

COURSE OBJECTIVE

To impart knowledge on various weaving preparatory processes, working principle of shedding, picking and beat-up motions of shuttle and shuttle less loom and basic woven fabric structures.

COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Explain the winding, warping and sizing process
2. Describe the working principle of primary, secondary, auxiliary motions and Dobby, Jaquard.
3. Explain the fundamentals of beat up, take-up and let-off motions; various principles of weft insertion in shuttle and shuttle less looms
4. Explain the elementary features of woven design and explain the construction of different elementary weaves with appropriate diagrams
5. Explain the design of dobby and jacquard fabrics

Unit I Weaving Preparation 9

Winding: Principle of cone winding machines; yarn clearers; Principle of pirn winding machine; Type of beam warping and sectional warping machines; Sizing: Objects of sizing and size ingredients.

Unit II Basics of loom mechanism -I 9

Looms – types of looms, basic motions; primary, secondary and auxiliary motions. Principles of Dobby and Jacquard.

Unit III Basics of loom mechanism –II 9

Principles of Beat-up mechanisms, Principle of take-up and let-off motions.
Shuttle and shuttle less weaving machines, Principles of weft insertion by shuttle, projectile, jet and rapier; multi-phase weaving systems.

Unit IV Elementary Weaves 9

Elements of woven design: Design, Draft and its types, Peg plan and Repeat
Construction of elementary weaves: Plain weave and its derivatives: warp rib, weft rib, matt rib and huck-a-back; Twill weave and its derivatives: ordinary twill, herringbone twill and zigzag twill, Satin, Sateen and their derivatives, Honeycomb, Ordinary and Brighton honeycomb, Crepe weave and its modifications. Fabric structures and its commercial name.

Unit V Dobby and Jacquard Design 9

Spot figuring: Basic dobby, Jacquard designs; Arrangement of motifs in dobby and Jacquard designs; Extra-warp and extra-weft figuring with single colour; Extra-warp and extra-weft figuring with two colours;
Mock leno: Perforated mock leno, Warp way distorted mock leno, Weft way distorted mock leno

Total: 45 hours

TEXT BOOKS

1. Lord P. R. and Mohammed M. H., "**Weaving: Conversion of Yarn to Fabric**", Merrow Publishing Co. Ltd., UK, 1998
2. Talukdar M. K., Sriramulu P. K. and Ajgaonkar D. B., "**Weaving: Machines, Mechanisms, Management**", Mahajan Publishers Pvt Ltd, 2004
3. Gokarneshan N., "**Fabric Structure and Design**", New Age International (P) Limited, 2009

REFERENCES

1. Spencer D.J., "**Knitting Technology**", Pergamon Press Oxford, 1982
2. Paling D.F., "**Warp Knitting Technology**", Columbine Press Baxton, 1975
3. W.S. Murphy, "**Handbook of Weaving**", Abhishek Publicati
4. H. Nisbet, "**Grammar of Textile Design**", Taraporewala and Sons Co. Pvt. Ltd., 1994
5. W.S. Murphy, "**Textile Weaving and Design**", Abhishek Publications, 2000

U15FT403R KNITTED FABRIC MANUFACTURE AND STRUCTURE 3 0 0 3

COURSE OBJECTIVE

The course aims to help the students to understand the basics of the knitting industry, warp and weft knitted structures, concept, analyze a knitting fabric and make its knitting, relationships between knit fabric structures and the technology and non woven fabric manufacture and applications

COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Describe the basic terms, specifications and functions of warp and weft knitting machines
2. Describe different stitches and pattern mechanisms used for the production of weft knitted fabrics
3. Identify the different structures of the basic weft knitted structures and its derivatives
4. Indentify and explain the representation of warp knitted fabrics
5. Discuss the methods of production and the applications of common types of nonwoven fabrics.

UNIT I Introduction 9

Weft Knitting: Classification, Functional Elements: Needles, Loop forming sequence, Sinkers, Cylinder, Dial, Cams, Creels, Feeder, Fabric Spreader, Take down and winding Mechanism. Machine description - Single Jersey, Rib, Purl and Interlock machine.

Warp Knitting: Classification, Functional Elements: Overlap and Underlap, Machine elements: Needle bar, Sinker bar, Guide bar, Presser bar, Warp beam, Pattern wheel, Chain links, Latch wire, Trick plate, Knitting Cycle of Tricot and Raschel machine.

UNIT II Basic Stitches, Basic weft Knitted Structures and Pattern Mechanism 9

Knit stitch, float stitch, tucksstitch: Properties, Symbolic and diagrammatic representation of stitches.

Basic Weft Knitted Structures: Single Jersey, Rib, Purl and Interlock. Line, Symbolic and diagrammatic notations of basic weft knitted structures, Properties.

Patterning mechanism: Pattern wheel, Pattern drum, Peg drum machine, Punched steel tape, Punched paper roll jacquard, Electronic devices for needle selection.

UNIT III Derivatives of Plain Jersey, Rib and Interlock Structures 9

Derivatives of plain knit: Lacoste, cross tuck, satin, Knitted twill, Jersey blister, Plaiting, seer sucker effect, accordion fabrics.

Derivatives of Rib knit: 2x2 Rib, 3x2 Rib, 5x1 Derby rib, Half cardigan, Full cardigan.

Derivatives of Purl knit: 2x2 Purl, 4x2 Purl, Basket Purl

Derivatives of Interlock Structure: Eight lock, Ponte-di-roma, Texi-pique, Milano rib

Striped patterns: Horizontal stripe patterns, Vertical stripe patterns, Square patterns.

Fabric structure and its commercial name.

UNIT IV Warp Knitted Structures 9

Principle stitches of warp knitting: 1 and 1 lapping – pillar or chain stitch – in lay stitch – blind stitch – 2 and 1 lapping – longer lapping – atlas stitch.

Study and representation: Full Tricot, Locknit, Reverse Locknit, Satin, Shark Skin, queen's cord

Fabric structure and its commercial name.

Unit V Non-Woven Fabric 9

Process sequence in manufacturing of non woven fabrics; Method of non-woven fabric manufacture: Mechanical bonded, Chemical bonded, Thermal bonded, Spun bonded and Melt blown. Applications of non-woven fabrics.

TOTAL: 45 hours

TEXT BOOK

1. Anbumani N., **Knitting-Fundamentals, Machines, Structures and Developments**, New Age International Publishers, 2007.

REFERENCES

1. Ajgaonkar D.B., **Knitted Technology**, Universal Publishing Corporation, Mumbai, 1998.
2. Spencer D.J., **Knitting Technology: A Comprehensive Handbook**, Woodhead Publishing Limited, England, 3rd Edition, 2001.

U15FT404R CHEMICAL PROCESSING OF TEXTILES AND GARMENTS 3 0 2 4

COURSE OBJECTIVE

To enable students, understand and explain the process of scouring, bleaching and dyeing of cotton and polyester fabrics with various dyes using different dyeing machines; printing of cotton with different styles.

COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Explain the various grey preparatory processes for woven and knitted fabrics
2. Describe the process of dyeing of cotton with direct, reactive and vat dyes
3. Describe the process of dyeing of Polyester and PC Blends with disperse dyes
4. Explain various methods and styles of printing
5. Describe the process involved in finishing and evaluation procedure of dyed and printed materials
6. Perform lab-scale bleaching, dyeing and printing of given textile materials
7. Assess the colour fastness of dyed textiles and determine the shrinkage of woven and knitted fabrics

UNIT- I Grey Preparation 9

Singeing: Objectives of singeing.
Desizing: Objectives, enzyme desizing, their relative advantages and disadvantages.
Principle and working of machines used in grey preparation: padding mangles, jigger, winch, J-box.
Scouring: Purpose and process, continuous methods of scouring.
Bleaching: Bleaching of cotton goods with hydrogen peroxide.
Mercerisation: Objective and principle of fabric mercerisation; outline of pad-less chainless fabric mercerisation.

UNIT- II Dyeing of Natural Fibres 9

Fundamentals: Classification of colorants, difference between dye and pigment, common terms used in textile colouration.
Direct dyes: Properties and classification, dyeing of cotton with direct dyes.
Reactive dyes: Properties and classification, dyeing of cotton with M and VS reactive dyes
Acid Dyes: Dyeing of silk and wool.

UNIT- III Dyeing of Polyester and PC Blends 9

Disperse dyes: properties and classification, dyeing of polyester with disperse dyes using Jet dyeing machine and continuous methods.
Dyeing of PC Blends: polyester/cellulosic blends dyeing by one and two bath process.
Dyeing equipment: Principles of working of soft-overflow jet dyeing machine, garment dyeing machines.

UNIT-IV Printing 9

Methods of printing: Principles of block, batik, flat-bed, rotary screen and transfer printing; study of chest printing machine for knitted goods.
Styles of printing: Principles of direct, discharge and resist styles of printing; printing with reactive dyes and pigments.

UNIT –V Fabric finishes, Dyeing and Printing Quality Evaluation 9

Computer colour matching: Principles of computer colour matching system; pass/fail decision making.
Colour fastness: Assessment of colour fastness of dyed goods to washing, rubbing, light and perspiration.
Dyeing and Printing faults: Dyeing and printing faults.

Fabric Finishes: Basic principles of calendaring, raising, sanforising, compacting of knitted fabric and softening finish.

LIST OF EXERCISES

1. Bleaching of cotton using hydrogen peroxide. (1 session)
2. Dyeing of cotton with M brand reactive dyes. (1 session)
3. Dyeing of silk / wool with acid dyes (2 sessions)
4. Screen printing of cotton fabric (1 session)
5. Determination of colour fastness to washing and rubbing (2 sessions)
6. Determination of shrinkage for woven and knitted fabrics (1 session)

Total: 60 hours

TEXTBOOK/S

1. Koushik C. V. and Antao Irwin Josico, "**Chemical Processing of Textiles – Grey Preparation and Dyeing**" – NCUTE Publication, New Delhi, 2004 (Units 1, 2 and 5)
2. Shenai V. A., **Technology of Finishing** Sevak Publications, Mumbai, 1995, Nitra, "Pollution Control in Textile
3. D G Dugg and S Sinclair, "**Giles's Laboratory Course in Dyeing",** Woodhead Publishing Limited (Fourth edition) December 1989

REFERENCES

1. Shenai V. A., **Technology of Textile Processing – Vol. III, IV, V, VII and VIII,** Sevak Publications, Mumbai, 1995
2. Palmer John W., **Textile Processing and Finishing Aids: Recent Advances**, Mahajan Book Distributors, 1996
3. Ronald James W., **Printing and Dyeing of Fabrics and Plastics**, Mahajan Book Distributors, 1996
4. Dr. C. N. Sivaramakrishnan, " **A compilation of 10 papers**", Colorage
5. L. W. C Wiles, "**Textile Printing**" (Merrow Monographs. Textile Technology

U15FT405R GARMENT CONSTRUCTION - I 3 0 0 3

COURSE OBJECTIVE

To impart knowledge on various types of seams, seam finishes, stitches, sewing threads, the method of construction of different types of sleeves, collars, yokes, fullness, hem, necklines, pockets, plackets, waist bands, cuffs and the techniques involved in the fastening of garment closures.

COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Explain the various types of seams, seam finishes, stitches and sewing threads
2. Discuss the method of construction of different types of sleeves and collars
3. Explain the steps in the construction of yokes, fullness, hem, necklines and hems
4. Describe stitching methods used for pockets, plackets, waist bands and cuffs
5. Explain the techniques involved in the construction of garment closures

Unit I Seams and Stitches 9

Seams: Definition, Federal classification of seams, Seam quality, Seam performance, Factors to be considered in the selection of Seam, Seam finishes.

Stitches: Definition, Federal classification of Stitches, Stitch parameters, Factors to be considered in the selection of stitches.

Sewing thread: Selection of sewing thread for woven and knitted garments.

Unit II Sleeves and Collars 9

Sleeves: Types of sleeves, Construction procedure of Plain, Puffs, Gathered, Bell, Bishop, Circular, Leg-o-mutton, Magyar, Dolman and Kimono sleeve.

Collars: Classification –Construction procedure of Cape, Peter pan, Puritan, Sailor, Square, Rippled, Scalloped, Mandarin, Shirt, Shawl and Notch collar.

Unit III Yokes and fullness 9

Yokes: Definition – Selection of yoke design, Different styles of yoke. Simple yoke – yokes with or without fullness – Midriff yokes, Methods of attaching yokes.

Fullness: Definition types, Darts–single, Double, Pointed darts, Tucks- pin tucks, Cross tucks, Piped tucks, Shell tucks, Pleats,- knife pleats, Box pleats, Invertible box pleats, Kick pleats, Flare, Godets, Gathers, Shirrings, Single and Double frills.

Hemming Techniques: Definition, Factors to be considered in the selection of hems, Types of machine stitched hem, Hand stitched hem.

Neckline Finishes: Preparation and uses of True Bias, Facings, and Binding.

Unit IV Pockets and Plackets 9

Plackets: Types, two piece plackets, continuous plackets, Kurtha plackets, Shirt cuff placket

Pockets: Types – patch pocket, patch with lining, Patch with flap, Front hip, Set-in seam, Slash pocket - Single lip, Double lip, with flap.

Waistband: One-piece, Two-piece and Tailor waistband, Elastic applied **Cuffs:** Types, square shape, Round shape.

Unit V Fasteners 9

Introduction and construction techniques of garment closures: Applications of zippers, Types of button and button holes and their applications, Types and applications of hooks and eye snaps; Velcro, Eyelets, Cords.

Total: 45 hours

TEXT BOOKS

1. Marie Clayton, **"Ultimate Sewing Bible – A Complete Reference with Step-by-Step Techniques",** Collins & Brown, London, 2008.
2. Clair B. Shaeffer "**The Complete Book of Sewing Shortcuts**" Sterling Publishing Company, 1981.

REFERENCE BOOKS

1. Claire Shaeffer, "**Sewing for Apparel Industry**", Prentice Hall, 2000.
2. Cooklin Gerry, "**Garment Technology for Fashion Designers**", Blackwell Science Ltd., 1997.
3. Laing, Webster J "**Stitches and Seams**" Woodhead Publishing Ltd., 1998.
4. Leila Aitken, "**Step by Step Dress Making Course**", BBC Books, 1992.

COURSE OBJECTIVE

To develop the design, draft and peg plan for the common woven fabrics with their constructional parameters and to develop 2D simulations of different textile design using various tools of textile CAD software.

COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Analyse the common woven fabrics and develop the related design, draft and peg plan
2. Determine the cloth particulars for given fabrics
3. Utilise effectively the different tools in textile CAD software
4. Create/Develop different textile design and prepare their 2D simulations

LIST OF EXPERIMENTS

Analyse the structures of woven fabric Designs

1. Plain, Twill, Satin.(1 session)
2. Mock-leno and Honey comb.(1 session)
3. Dobby cloth analysis. (1 session)
4. Jacquard cloth and Terry towels. (1 session)
5. Extra warp and extra weft figuring. (2 sessions)

Analyse the structures of knitted fabric Designs

1. Single jersey, rib and interlock (2 sessions)

Study and practice of

1. Different tools used in textile CAD software. (1 session)
2. Development of dobby design and preparation of its 2D simulation. (1 session)
3. Development of jacquard design and preparation of its 2D simulation. (1 session)
4. Development of print design and preparation of its 2D simulation. (1 session)

TOTAL: 45 hours

Textile CAD and Fabric Structure Laboratory
List of equipment required for a batch of 30 students for U.G

S. No.	Name of the equipment / software	Quantity Required
1.	**Module (Software)**	
	Designing Dobby Design	15
	Designing Jacquard Design	15
	Designing Print design	15
2.	**Hard Ware**	
3.	Pentium III / higher PCs Configuration to Support the Software	30
4.	Printer	1
5.	Scanner	1
6.	GSM Cutter and Scale	2
7.	Beesley Balance	4
8.	Course length tester	1
9.	Counting Glass	30
10.	Electronic Balance	1
	Total	**115**

U15FT407R GARMENT CONSTRUCTION LABORATORY – I 0 0 4 2

COURSE OBJECTIVE

To train students to construct different types of seams, seam finishes, darts, tucks, pleats, plackets, neckline finishes, pockets and sleeves to acceptable quality levels.

COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Construct different types of seams, seam finishes, darts, tucks and pleats to acceptable quality levels
2. Stitch different types of plackets to acceptable quality levels
3. Construct different neckline finishes such as bias binding, facing and collars to acceptable quality levels
4. Stitch various types of pockets and sleeves to acceptable quality levels
5. Explain the method of taking measurements for children's garments and describe the process involved in pattern making and the construction of children's wear.

List of Experiments

1. Preparing samples of Basic seams, Seam finishes, Darts, Tucks and Pleats (2 sessions)
2. Preparing samples of plackets – Continuous bound placket, 2 piece placket and Tailors Placket (1session)
3. Preparing samples of necklines – Bias facing, Shaped facing and Bias binding (1session)
4. Preparing samples of collars – Peter Pan collar, Mandarin collar and Shirt collar.(2 sessions)
5. Preparing samples of pockets –Patch pocket, set in seam pocket and Bound pocket (2 sessions)
6. Preparing samples of Sleeves –Plain sleeve, Bell sleeve, puff sleeve, Raglan sleeve and Kimono sleeve(1session)
7. Develop the pattern and construct children's body/sleep suit(1session)
8. Develop the pattern and construct children's rompers(1session)
9. Develop the pattern and construct children's frock(1session)

Total: 45 hours

Garment Construction Laboratory - I
List of equipment required for a batch of 30 students for U.G

S. No.	Name of the equipment / software	Quantity Required
1.	Single-needle lock-stitch machine	30
2.	Steam Iron	3
3.	Fusing Machine	1
	Total	**34**

U15ENG401R COMMUNICATION SKILLS LABORATORY 0 0 2 1

(Common to all branches of Third / Fourth Semester B.E / B.Tech programmes)

Course Outcome: At the end of the course, the students will be able to

- Communicate confidently and effectively
- Demonstrate active listening skills
- Practice soft skills and interpersonal skills to excel in their jobs.
- Use language efficiently to face interviews, participate in group discussions and present speeches.

1. **Listening Comprehension**: Listening and typing – listening and sequencing of sentences – Filling in the blanks – Listening and answering questions.
2. **Reading Comprehension**: Filling in the blanks – Cloze exercises – Vocabulary building – Reading and answering questions.
3. **Speaking: Phonetics**: Intonation – Ear training – Correct Pronunciation – Sound recognition exercises – Common errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

4. Making presentations: introducing oneself – introducing a topic – answering questions – individual presentation practice
5. Creating effective PPTs – presenting the visuals effectively
6. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
7. Preparing job applications - writing covering letter and résumé
8. Applying for jobs online - email etiquette
9. Participating in group discussions – understanding group dynamics - brainstorming the topic – mock GD
10. Training in soft skills - persuasive skills – people skills - questioning and clarifying skills
11. Writing Project proposals: collecting, analyzing and interpreting data / drafting the final report
12. Attending job interviews – answering questions confidently
13. Interview etiquette – dress code – body language – mock interview

TOTAL: 30 PERIODS

REFERENCE BOOKS:

1. Dhanavel, S.P. 2010. English and Soft Skills. Hyderabad: Orient BlackSwan Ltd.
2. Corneilssen, Joep. How to Prepare for Group Discussion and Interview. New Delhi: Tata-McGraw-Hill, 2009.
3. D'Abreo, Desmond A. Group Discussion and Team Building. Mumbai: Better Yourself Books, 2004.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh. The ACE of Soft Skills. New Delhi: Pearson, 2010.
5. Gulati, Sarvesh. Corporate Soft Skills. New Delhi: Rupa and Co. 2006.
6. Van Emden, Joan, and Lucinda Becker.Presentation Skills for Students. New York: Palgrave Macmillan, 2004.
7. Turton, N.D and Heaton, J.B. Dictionary of Common Errors, Addision Wesley Longman Ltd., Indian reprint 1998.

EXTENSIVE READING

1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press, 1989.
2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.

U15FT4058R **IN-PLANT TRAINING** **0 0 0 1**

COURSE OBJECTIVES

To provide exposure to the real world of garment manufacturing system.

COURSE OUTCOMES

At the end of the study of this training, the students will be able to

1. Get training in real world of production
2. Prepare an in-plant training report

- The students have to undergo a 2-week in-plant training related to the subject learnt in the immediately preceding semesters.
- The students have to submit a report of their in-plant training.
- A committee of three staff members as internal examiner and an external examiner will conduct a Viva voce and evaluate student performance.
- Students successfully completing the 2-week in-plant training will be awarded one credit.

Semester – IV	U15GE401R: SOFT SKILLS AND APTITUDE -II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I* in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate verbal aptitude with regard to given topics and score 65-70% marks in placement specific internal tests

1.Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2.Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Number system b. H.C.F and L.C.M c. Averages d. Percentages e. Ratio and Proportion f. Problems on Ages g. Partnership h. Allegation and Mixture i. Profit and Loss j. Time and Distance k. Problems on Trains l. Permutation and Combination m. Probability n. Time and Work o. Pipes and Cisterns p. Clocks q. Blood Relations r. Seating Arrangement s. Symbols and Series t. Syllogism u. Direction Sense v. Coding and Decoding w. Cubes and Dice x. Arithmetic Reasoning y. Company specific aptitude questions

3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Synonyms b. Antonyms c. Verbal analogy d. Editing passages e. Sentence filler words (one and two) f. Jumbled sentences g. Reconstruction of sentences (PQRS) h. Idioms and phrases i. Spotting errors j. Writing captions for given pictures k. Tenses l. Prepositions m. Reading comprehension n. Choosing the correct / incorrect sentences o. Describing given pictures p. Critical reasoning q. Theme detection r. Articles s. Cloze test t. Company specific aptitude questions

* SSA-I is Soft Skills and Aptitude – I