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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15CE601	Foundation Engineering	3	0	0	3
2	U15CE602	Structural Analysis – II	3	2	0	4
3	U15CE603	Highway Engineering	3	0	0	3
4	U15CE604	Design of Steel Structures - II	3	2	0	4
5	U15CE915	**Elective** – Design of RC Structures	3	0	0	3
Open Elective						
6	U15ME1005	Renewable Energy Sources	3	0	0	3
	U15FT1001	Fundamentals of Fashion Design				
	U15ME1003	Industrial Safety				
	U15CS1002	Mobile Application Development				
	U15IT1004	Python Programming				
	U15EC1003	Satellite Communication				

Approved By

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

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

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
	U15ME1002	Industrial Robotics				
	U15EE1002	Energy Conservation and Management				
	U15CS1003	Object Oriented Programming and Data Structures				
	U15CS1001	Internet of Things				
Practical						
7	U15CE605	Environmental Engineering Laboratory	0	0	4	2
8	U15CE606	Structural Design and Drawing Laboratory	0	0	4	2
9	U15GE601A	Professional Development Skills	0	0	2	1
					Total Credits	**25**

Approved By

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

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

U15CE601 Foundation Engineering L T P C 3 0 0 3 100

COURSE OBJECTIVES

To enable students to,

1. Define and explain the site investigation methods, boring techniques, sampling techniques, field tests to calculate the shear strength of soil and selection of foundation based on soil conditions
2. Classify types of foundation, field test of safe bearing capacity of different settlements
3. Explain pressure distribution below the footing & raft analysis and proportioning of various types of shallow foundation
4. State the various types of piles based on its functions, site testing and group capacity under settlement consideration
5. Deliver the complete design and analysis of retaining walls in various site conditions both analytical and graphical methods

Unit -I Site Investigation and Selection of Foundation 9

Scope and objectives – Methods of exploration-Averaging and boring – Water boring and rotatory drilling – Depth of boring – Spacing of bore hole

Sampling – Distributed and undisturbed sampling – sampling techniques – Split spoon sampler, Thin tube sampler, Stationary piston sampler – sampling- sampling technique

Bore log report – Penetration tests (SPT and SCPT) –Selection of foundation based on soil condition – bore log report

Unit -II Shallow Foundation 9

Introduction – Location and depth of foundation by codal provisions

Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula (only)– factors affecting bearing capacity – problems - Bearing Capacity from insitu tests (SPT, SCPT and plate load) – Allowable bearing pressure

Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits – Allowable settlements– Methods of minimizing settlement, differential settlement

Unit –III Footings and Rafts 9

Types of foundation – Contact pressure distribution below the footings & raft - Isolated, combined footings and mat foundation proportioning (no structural design) –floating foundation - **Foundations on expansive soil** - Identification of expansive soil

Unit -IV Deep Foundation -Piles 9

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil - Static formula - dynamic formulae (Engineering news and Hiley's)- **Truss Analogue method**

Capacity from insitu tests (Pile load test) – Negative skin friction – uplift capacity – Group capacity by different methods (Feld's rule, Converse Labarra formula and block failure criterion) **Settlement of pile groups** –pile load test under reamed piles

Unit –V Retaining Walls 9

Plastic equilibrium in soils – active and passive states – **Rankine's theory** – cohesionless and cohesive soil - **Coloumb's wedge theory** – Earth pressure on retaining walls of simple configurations – Graphical methods (Culman's method only)– Stability of retaining walls

Total : 45 Hours

TEXT BOOKS

1. Venkatramaiah C.,"Geotechnical Engineering", New Age International Publishers, New Delhi, 2009
2. Gopal Ranjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Pvt Ltd., New Delhi, 2007

REFERENCES

1. Das B.M., "Principles of Foundation Engineering (Fifth Edition), Thomson Books / COLE, 2003
2. Murthy V.N.S., Text book of "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi, 2007
3. Bowles J.E., "Foundation Analysis and Design", McGraw-Hill, 1994
4. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2005
5. Kaniraj S.R., "Design Aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2007
6. Arora K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors Pvt. Ltd., New Delhi, 2000
7. P.C.,Varghese, "Foundation Engineering", Prentice Hall of India Pvt Ltd., New Delhi, 2005

U15CE602 Structural Analysis – II L T P C 3 2 0 4 100

COURSE OBJECTIVES

To enable students to,

1. Analyse the continuous beams and frames by matrix flexibility method
2. Analyse the continuous beams and frames by matrix stiffness method
3. Explain Finite element method
4. Calculate shape factor for different sections
5. Analyse the continuous beams and frames by plastic method of analysis
6. Analyse the space truss by method of tension coefficients
7. Discuss curved beams, suspension cables and cables with stiffening girders

Unit I Matrix Flexibility Method 9 + 3

Introduction to matrix methods – Indeterminacy - Primary structure – Transformation matrix – Global and element flexibility matrix - Compatibility conditions – Analysis of continuous beams, Rigid and pin jointed plane frames (with redundancy restricted to two)

Unit II Matrix Stiffness Method 9 + 3

Element and global stiffness matrices – Co-ordinate transformations - Rotation matrix - Transformations of stiffness matrices, load vectors and displacements vectors - Analysis of continuous beams –Analysis of pin-jointed plane frames and rigid frames (with redundancy restricted to two)

Unit III Finite Element Method 9 + 3

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element –Plane stress and plane strain Triangular elements

Unit IV Plastic Analysis of Structures 9 + 3

Plastic bending of beams – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems

Unit V Space and Cable Structures 9 + 3

Analysis of Space trusses using method of tension coefficients – Beams curved in plan
Suspension cables - cables with two and three hinged stiffening girders

Tutorial : 15 Hours

Total : 60 Hours

TEXT BOOKS

1. Vaidyanathan R., and Perumal P., “Comprehensive Structural Analysis – Vol. I & II”, Laxmi Publications, New Delhi, 2003
2. L.S. Negi & R.S., Jangid, “Structural Analysis”, Tata McGraw-Hill Publications, New Delhi, 2003

REFERENCES

1. Ghali A., Nebille A.M., and BrownT.G., “Structural Analysis”, A unified classical and Matrix approach”, - 5th edition, Spon Press, London and New York, 2003
2. Vazirani V.N., & Ratwani, M.M., “Analysis of Structures”, Khanna Publishers, Delhi
3. Structural Analysis – A Matrix Approach – G.S., Pandit & S.P., Gupta, Tata McGraw Hill
4. Matrix Analysis of Framed Structures – Jr., William Weaver & James M., Gere, CBS Publishers and Distributors, Delhi
5. Coates R.C., Coutie M.G., and Kong F.K., “Structural Analysis”, ELBS and Nelson, 1990
6. Y.M., Desai, T.I., Eldo & A.H.,Shah, “Finite Element Method With Application in Engineering”, PEARSON Publication, 2011

U15CE603 HIGHWAY ENGINEERING L T P C 3 0 0 3

OBJECTIVES:

- To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods.

UNIT I HIGHWAY PLANNING AND ALIGNMENT (8)

Significance of highway planning – Modal limitations towards sustainability – History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis – Road ecology – Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS (12)

Typical cross sections of Urban and Rural roads — Cross sectional elements – Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves – Gradients, Special consideration for hill roads – Hairpin bends – Lateral and vertical clearance at underpasses.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS (9)

Design principles – pavement components and their role – Design practice for flexible and rigid Pavements (IRC methods only) – Embankments .

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE (8)

Highway construction materials, properties, testing methods – CBR Test for subgrade – tests on aggregate & bitumen – Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) – Quality control measures – Highway drainage — Construction machineries.

UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS (8)

Pavement distress in flexible and rigid pavements – Pavement Management Systems – Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Types of maintenance – Highway Project formulation.

TOTAL: 45 HOURS

OUTCOMES:

- The students completing this course would have acquired knowledge on planning, design, construction and maintenance of highways as per IRC standards and other methods.

TEXT BOOKS:

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. “Highway Engineering”, Nemchand Publishers, 2014.
2. Subramanian K.P., “Highways, Railways, Airport and Harbour Engineering”, Scitech Publications (India), Chennai, 2010
3. Indian Road Congress (IRC), Guidelines and Special Publications of Planning and Design.

U15CE604 Design of Steel Structures - II **L T P C 3 2 0 4 100**
(Limit State Design)

COURSE OBJECTIVES

To enable students to,
1. State the general principle in the design of steel structures
2. Design various types of light gauge sections
3. Analyse and design of industrial structures
4. Design steel chimneys and water tanks

Unit I Design of Special Elements **9 + 3**

Design of varies types of Built-up Purlins - Design of Wind girders - Design of Beam -columns - With various support conditions - Design of foundations-with lateral forces

Unit II Light Gauge Sections **9 + 3**

Design of light gauge steel members- concepts-effective width- stiffened sections – multiple sections- local and post buckling of thin element

Unit III Industrial Buildings **9 +3**

Industrial buildings- Design of gantry girder-.braced and unbraced - Gable frames with gantry-Rigid industrial frames

Unit IV
Design of Chimneys **9 + 3**

Design of self supporting steel chimneys –design of guyed chimneys using gust factor method

Unit V Special Structures **9 + 3**Basic structural configurations – loads on towers - wind loads -– design of steel water tanks

Tutorial : 15 Hours
Total : 60 Hours

TEXT BOOKS

1. Jayagopal L. S., Tensing, D.," Design of Steel Structures", Vikas Publishing Pvt Ltd, New Delhi, 2015
2. Subramanian N., "Design of Steel Structures", Oxford University Press, NewDelhi, 2008

REFERENCES

1. Duggal S.K., "Limit State Design of Steel Structures", Tata McGraw Hill Education Private Ltd., New Delhi, 2011
2. Ram Chandra, "Design of Steel Structure –II", Rajsons Publications Pvt. Ltd., New Delhi, 2011
3. Neal B.G., "Plastic Method of Structural Analysis", 1975
4. Arya S and Ajmani J.L., "Design of Steel Structures", Nem Chand & Bros, Roorkee
5. Dayaratnam P., "Design of Steel Structures", Wheeler and Co, New Delhi 1999

U15CE605 Environmental Engineering Laboratory L T P C 0 0 4 2 100

COURSE OBJECTIVES

To enable students to,

1. Determine the pH, Turbidity, hardness and dissolved oxygen
2. Determine types of solids present in water and waste water
3. Determine the microbial colony count in drinking water
4. Determine the biological oxygen demand
5. Determine the Chemical oxygen demand

LIST OF EXPERIMENTS

1. Sampling and preservation methods and significance of characterisation of water and waste water.
2. Determination of

    i) pH and turbidity
    ii) Hardness

3. Determination of iron & fluoride
4. Determination of residual chlorine
5. Determination of Chlorides
6. Determination of Ammonia Nitrogen
7. Determination of Sulphate
8. Determination of Optimum Coagulant Dosage
9. Determination of available Chlorine in Bleaching powder
10. Determination of dissolved oxygen
11. Determination of suspended, volatile and fixed solids
12. B.O.D. test
13. C.O.D. test
14. Introduction to Bacteriological Analysis (Demonstration only)

Total : 45 Hours

REFERENCES

1. Standard methods for the examination of water and wastewater, APHA, 20th Edition, Washington, 1998
2. Garg S.K., “Environmental Engineering Vol. I & II”, Khanna Publishers, New Delhi
3. Modi P.N., “Environmental Engineering Vol. I & II”, Standard Book House, Delhi-6

List of Equipment

(For a batch of 30 students)

S. No.	Description of Equipments	Quantity
1	pH meter	1 no.
2	Turbidity meter	1 no.
3	Conductivity meter	1 No.
4	Refrigerator	1 No.
5	BOD incubator	1 No.
6	Muffle furnace	1 No.
7	Hot air oven	1 No.
8	Magnetic stirrer with hot plates	5 Nos.
9	Desicator	1 No.
10	Jar test apparatus	1 No.
11	Water bath	1 No.
12	Furniture	1 lot
13	Glass waves / Cruicibles	1 lot
14	Chemicals	1 lot
15	COD apparatus	1 No.
16	Kjeldane apparatus	1 No.
17	Heating mantles	5 Nos.
18	Calorimeter	1 No.
19	Chlorine comparator	1 No.
20	Furniture : Work table	10 Nos.
21	Beaker	30 Nos.
22	Standard flask	30 Nos.
23	Burette with stand	15 Nos.
24	Pipette	15 Nos.
25	Crucible	15 Nos.
26	Filtration assembly	1 No.
27	Chemicals	Lot

U15CE606 Structural Design and Drawing Laboratory L T P C 0 0 4 2 100

COURSE OBJECTIVES

To enable students to,

1. Design manually the Retaining wall, water tank, 4 bridges
2. Enhance the software proficiency
3. List various IRC loadings and the concept of pre-stressing
4. Explain the design of plate girder and truss girder for various loading conditions
5. Design steel and concrete structural components and transfer the design into drawings as per IS Codes

Design and Drafting of the following Structures

(Manual Design and Drafting by Software)

1. RCC Cantilever Retaining Wall
2. RCC Counterfort Retaining Wall
3. RCC Underground Water Tank
4. RCC Overhead Circular and Rectangular Water Tanks
5. RCC Solid slab bridge
6. RCC Tee beam bridge
7. Rectangular Steel Tank
8. Welded Plate Girder Bridge
9. Truss Girder Bridge

Total: 60 Hours

TEXT BOOKS

1. Krishnaraju, "Structural Design & Drawing", (Concrete & Steel – Volume II and III) –CBS Publishers, 2004
2. B.C., Punmia, Ashok Kumar Jain & Arun Kumar Jain, "Comprehensive Design of Steel Structures", Laxmi Publications Pvt. Ltd., 2003

REFERENCES

1. Krishnamurthy, D., Structural Design and Drawing Vol. II, CBS, Publishers & Distributors, Delhi, 1992
2. Krishnamurthy, D., Structural Design and Drawing Vol. III (Steel Structures), CBS, Publishers & Distributors, Delhi, 1992

List of Equipments

(For a batch of 30 students)

Sl. No	Description of Equipments	Quantity
1	Computer system of Pentium IV or equivalent	1 for each student
2	Licensed version of any reputed Analysis, Design & Drafting software	1 copy for a set of 3 students

Semester –VI	U15GE601A:Professional Development Skills	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. Explain the values of career planning and prepare a resume.
2. Demonstrate interview skills and undergo mock interviews and group discussions.
3. State entrepreneurship and prepare business plan.

Demonstrating Soft -Skills capabilities in the following areas:

a. Career planning (Employment) – Resume writing - Tips for great resume

b. Interview Skills - Importance of body language in an interview – Confidence building – FAQs

c. Mock interview, mock stress interview

d. Mock Group Discussion

e. Career Planning (Self Employment) Understanding Entrepreneurship - Advantages of being an Entrepreneur - Create a Business plan.

Total - 36hrs

U15CE915 Design of RC Structures L T P C 3 2 0 4 100

COURSE OBJECTIVES

To enable students to,

1. Design and detailing of retaining walls
2. Design water tanks with staging and domes
3. Design staircase
4. Design flat slab
5. Design mat foundation
6. Design slabs by virtual work method
7. Design the masonry walls

Unit I Retaining Walls 9 + 3

Design and detailing of cantilever and counter fort RCC retaining walls

Unit II Water Tanks 9 + 3

Underground rectangular tanks – Domes – Overhead circular and rectangular tanks- Design of staging and foundations-Design as per BIS Codal Provisions

Unit III Special Topics 9 + 3

Design of flat slabs – Design of Reinforced concrete walls – Design of T beams Bridge Deck and Reinforcement

Unit IV Columns 9 + 3

Introduction – Types of columns –Design of combined rectangular footings for two columns.

Unit V Mat foundation 9 + 3

Design of masonry wallsas per NBC and IS codes- Design of piers, footings and mat foundation

Tutorial : 15 Hours
Total : 60 Hours

TEXT BOOKS

1. Krishna Raju N., "Design of RC Structures", CBS Publishers and Distributors, New Delhi, 2006
2. Punmia P.C., Ashok K., Jain and Arun K., Jain, "Reinforced Concrete Structures" Vol II", Laxmi Publications, New Delhi, 2000

REFERENCES

1. Mallick D.K., and Gupta A.P., "Reinforced Concrete", Oxford and IBH Publishing Company, 2007
2. Gambhir,M.L.,"Reinforced Concrete Structures", PHI Learning Private Ltd, New Delhi 2008
3. Syal,I.C and Goel,A.K; Reinforced Concrete Structures" , A.H Wheelers &Co Pvt Ltd , Third

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Branch: Mechanical Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15ME601	Finite Element Method	3	0	0	3
2	U15ME602	Turbo Machines	3	0	0	3
3	U15ME603	Design of Transmission System	3	0	0	3
4	U15ME604	Metrology and Measurements	3	0	0	3
5	U15ME9XX	Professional Elective *	3	0	0	3
6		Open Elective **	3	0	0	3
Practical						
7	U15ME605	Computer Aided Design and Analysis Laboratory	0	0	4	2
8	U15ME606	Metrology and Measurements Laboratory	0	0	4	2
9	U15ME607	Turbo Machines Laboratory	0	0	4	2
10	U15GE601B	Soft Skills and Aptitude-IV	0	0	2	1
					Total Credits	**25**

Approved By

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

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

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Branch: Mechanical Engineering

Professional Elective *

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15ME907	Gas dynamics and jet propulsion	3	0	0	3
2	U15ME909	Design of jigs, fixtures and press tools				
3	U15ME911	Composite materials and manufacturing				
4	U15ME913	Surface engineering				
5	U15ME915	Micro electro mechanical systems				
					Total Credits	**3**

Approved By

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

Copy to:-

HOD/Mechanical Engineering, Sixth Semester BE Mechanical Students and Staff, COE

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Branch: Mechanical Engineering

Open Elective**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15CE1001	Building Services and Safety Regulations	3	0	0	3
2	U15CE1002	Energy Efficiency And Green Building				
3	U15CE1003	Natural Disaster Mitigation and Management				
4	U15CS1001	Internet of Things				
5	U15CS1002	Mobile Application Development				
6	U15EC1001	Cellular And Mobile Communication				
7	U15EC1002	Embedded Systems				
8	U15EC1003	Satellite Communication				
9	U15EE1002	Energy Conservation and Management				
10	U15FT1001	Fundamentals of Fashion Design				
11	U15IT1001	Basic Data Structures				
12	U15IT1003	Problem Solving Techniques Using Java Programming				
13	U15IT1004	Python Programming				
					Total Credits	**3**

Approved By

Chairman, 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, Sixth Semester BE Mechanical Students and Staff, COE

Course Code	**U15ME601**	L	T	P	C
Course Name	**FINITE ELEMENT METHOD**	3	0	0	3

Pre-requisites subject: Engineering Mathematics, Numerical Methods, Strength of Materials and Heat and mass transfer

Course Outcomes

Upon completion of this course the students will be able to

CO1 Explain the fundamental concepts of mathematical modeling, process of discretization, matrix algebra, application of Gaussian elimination and the concepts of classical method in FEA.

CO2 Describe the fundamental concepts of solving one dimensional problem such as bar, rod, truss and beams.

CO3 Solve the two dimensional problems, scalar variable problems and vector variable problems.

CO4 Identify the procedure to use isoparametric concept on elements and the application of numerical integration.

CO5 Apply the concept of finite element in heat transfer and fluid mechanics problems.

Unit I INTRODUCTION L 9 T 0

Historical background –mathematical modeling- Application to the continuum – Discretisation – Matrix algebra – Gaussian elimination – Governing equations for continuum – Classical Techniques in FEM – Weighted residual method – Ritz method - engineering applications of FEA.

Unit II ONE DIMENSIONAL PROBLEMS L 9 T 0

Finite element modeling – Coordinates and shape functions- Potential energy approach -Galarkin approach – Assembly of stiffness matrix and load vector- linear bar element –nodal approximation – development of shape functions – quadratic shape functions - element matrices and vectors – extension to plane truss– development of element equations – assembly – element connectivity – global equations – solution methods –beam element – nodal approximation – shape functions – element matrices and vectors –assembly – solution.

Unit III TWO DIMENSIONAL PROBLEMS L 9 T 0

Scalar Variable Problems- Finite element modeling – CST element – Element equations, Load vectors and boundary conditions – Assembly - Vector Variable problems – Elasticity equations – Plane Stress, Plane Strain and Axisymmetric problems – Formulation – element matrices – Assembly – boundary conditions and solutions

Unit IV ISOPARAMETRIC ELEMENTS L 9 T 0

Natural coordinates, Iso parametric elements, Four node quadrilateral element– Shape functions – Element stiffness matrix and force vector – Numerical integration – Gauss quadrature.

Unit V APPLICATIONS IN HEAT TRANSFER & FLUID MECHANICS L 9 T 0

One dimensional heat transfer element – application to one-dimensional heat transfer problems and fluid mechanics problems- scalar variable problems in 2-Dimensions – application to two-dimensional heat transfer problems.

Total Number of hours: 45

Learning Resources

Text Books

1. Chandrupatla & Belagundu, "Introduction to Finite Elements in Engineering", Prentice-Hall of India, Eastern Economy Editions, 4th Edition, 2015, ISBN-13: 978-9332551824.
2. David V.Hutton, "Fundamentals of Finite Element Analysis", Tata McGraw-Hill Edition, 2005, ISBN: 9780070601222.

Reference Books

1. Logan D.L., "A First course in the Finite Element Method", Fourth Edition, Cengage Learning, 5th Edition, 2012, ISBN-13: 9788131517307.
2. Rao S.S., "The Finite Element Method in Engineering", Fourth Edition, Published by Elsevier, 5th Edition, 2010, Hardcover ISBN: 9781856176613, eBook ISBN: 9780080952048
3. P.Seshu, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd., NewDelhi, 2007. ISBN-978-203-2315-5.
4. J.N.Reddy, "An Introduction to the Finite Element Method", McGraw-Hill International Editions, 2005, 3rd Edition, ISBN: 9780070607415.

Course Code	**U15ME602**	L	T	P	C
Course Name	**TURBO MACHINES**	3	0	0	3

Pre-requisites subject: Engineering Physics and Fluid Mechanics

Course Outcomes

Upon completion of this course the students will be able to

- **CO1** Discuss the theory of turbo machine and the concept of energy equation of turbo machine.
- **CO2** Explain the classification, working, construction of velocity triangle and performances of hydraulic turbines.
- **CO3** Describe the working of centrifugal pumps, performance curves for pumps
- **CO4** Analyze the performance of steam turbines using velocity triangle and performances of turbine
- **CO5** Explain the construction and working of Gas turbines and Jet engines

Unit I INTRODUCTION L 9 T 0

Fluid machines-Classification. Turbo machines - parts of turbo machines. Comparison between positive displacement machines and turbo machines. Types of turbo machines. Euler's energy transfer equation –components of energy transfer.

Unit II HYDRAULIC TURBINES L 9 T 0

Hydraulic turbines-classification and working principle. Pelton wheel turbine -Francis turbine -Kaplan turbine- Velocity triangle-work done- Efficiencies- Performance calculations.

Unit III PUMPS L 9 T 0

Centrifugal pumps – classification – working - Velocity triangle-work done- Efficiencies- Specific speed-Performance calculations. Priming, Cavitation. Comparison between positive displacement pumps and roto dynamic pumps.

Unit IV STEAM TURBINES L 9 T 0

Introduction. Classification-Impulse and Reaction. Compounding –need for compounding-methods of compounding. Velocity diagram - condition for maximum efficiency-degree of reaction .simple problems on single stage turbines and governing of turbines.

Unit V GAS TURBINES AND JET ENGINES L 9 T 0

Brayton cycle – open cycle-closed cycle. Methods of improving the efficiency of a simple cycle. Multistage compression. Jet engines-construction and working of turbo jet engines, ram jet and pulse jet engines.

Total Number of hours: 45

Learning Resources

Text Books

1. B.K.Venkanna, “Fundamentals of Turbomachinery” PHL Learning Private Limited, 2014.
2. Yahya.S.M., ‘Turbines, Compressors and Fans”, Tata McGraw-Hill, 2010.

Reference Books

1. Bansal, R.K., Fluid Mechanics and Hydraulics Machines, Laxmi Publications (P) Ltd., New Delhi.2010
2. Sukumar Pati., “Fluid Mechanics and Hydraulics Machines”, Tata McGraw Hill publications (P) Ltd, New Delhi, 2012
3. Kumar. K.L., Engineering Fluid Mechanics (VII Ed.) Eurasia Publishing House (P) Ltd., New Delhi, 1995.
4. Ganesan .V., “Gas Turbines”, Tata McGraw-Hill, New Delhi, 2002.

Course Code	**U15ME603**	L	T	P	C
Course Name	**DESIGN OF TRANSMISSION SYSTEMS**	3	0	0	3

Pre-requisites subject: Kinematics of Machinery & Design of Machine elements

Course Outcomes

Upon completion of this course the students will be able to

- **CO1** Design the various transmission systems and its elements including flexible elements for complex mechanisms.
- **CO2** Design the spur and helical gear with related concepts and other gear designing terms.
- **CO3** Design the bevel and worm gear based for industrial applications.
- **CO4** Design the gear box for both constant speed and variable number of speeds in the transmission systems.
- **CO5** Design the clutches and Brakes and also able to utilize the same to solve practical problems.

Unit I DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS L 9 T 0

Design of flat belt, V - Belt and pulleys - Selection of flat belts and pulleys – V belts and pulleys – Selection of transmission chains and sprockets - Introduction to Wire ropes and modern transmission systems.

Unit II DESIGN OF SPUR GEARS AND PARALLEL AXIS HELICAL GEARS L 9 T 0

Design of Spur Gear: Terminology - Speed ratios and number of teeth -Force analysis - Tooth Stresses - Dynamic effects – fatigue strength - factor of safety - gear materials.

Design of helical gear :Terminology – Speed ratios and number of teeth – Force analysis – Tooth stresses – Dynamic effects – Fatigue strength – Factor of safety – Gear materials – Module and face width – Pressure angle in the normal and transverse plane – Equivalent number of teeth – Forces and stresses – Estimating the size of the helical gears

Unit III DESIGN OF BEVEL AND WORM GEARS L 9 T 0

Design of Straight bevel gears: Tooth terminology- Tooth forces and stresses – Equivalent number of teeth.

Worm Gear: Terminology – Thermal capacity – materials - forces and stresses and Efficiency - Design of Worm gear – Estimating the size of the worm gear pair.

Unit IV DESIGN OF GEAR BOXES L 9 T 0

Geometric progression – Standard step ratio – Ray diagram – Kinematics layout – Design of sliding mesh gear box – Constant mesh gear box – Design of multi speed gear box.

Unit V DESIGN OF CLUTCHES AND BRAKES L 9 T 0

Design of plate clutches – axial clutches - cone clutches - internal expanding rim clutches - internal and external shoe brakes.

Total Number of hours: 45

Learning Resources

Text Books

1. Bhandari V.B, “Design of Machine Elements”, Tata McGraw-Hill Education, 2010.
2. Kurt M. Marshek; Robert C. Juvinall, “Fundamentals of Machine Component Design”, 5th Edition, Wiley 2011.
3. Robert L Norton, “Machine Design - An Integrated Approach”, Pearson Education, New Delhi, 2003.

Reference Books

1. Joseph E. Shigley, Charles R. Mischke and Charles R. Mischke“Mechanical Engineering Design”, McGraw – Hill International Editions, 2003.
2. Prabhu, T.J., “Design of Transmission Elements”, Prabhu publisher, 2003.
3. Steven R. Schmid, Bernard J. Hamrock, Bo. O. Jacobson.,“ Fundamentals of Machine Elements”, CRC Press., 2013.
4. G.M. Maitra. and L.V. Prasad., “Hand book of Mechanical Design”, McGraw-Hill Inc., US, New edition 1985.

Course Code	**U15ME604**	L	T	P	C
Course Name	**METROLOGY AND MEASUREMENTS**	3	0	0	3

Pre-requisites subjects: Engineering Physics – Manufacturing Technology – I & II

Course Outcomes

Upon completion of this course the students will be able to

CO1	Explain fundamentals of General Measurement system and Errors in Measurement and Discuss fundamentals of Linear.
CO2	Explain the fundamentals of angular Measurements and comparators for measuring the different parameters.
CO3	Describe gear terminology, measurement of various elements of gears and analyze the working principle of various precision instruments based on laser.
CO4	Discuss the measurement of force, power, torque, flow, temperature and coordinate measuring machine.
CO5	Describe and use measurement techniques involved in Nano particle.

Unit I LINEAR MEASUREMENT L 9 T 0

Introduction to Metrology - General concept - Generalized measurement system - Units and standards – Accuracy-Precision – Errors in measurement- Linear measuring instruments - Vernier, micrometer, dial gauge, height gauge, depth gauge, slip gauges and classification, limit gauges.

Unit II ANGULAR AND FORM MEASUREMENT L 9 T 0

Angular measurements - Sine bar, optical bevel protractor – Autocollimator - angle alignment telescope - applications, Comparators: mechanical, pneumatic and electrical types, applications. Principles and Methods of straightness - Flatness measurement - Thread measurement – floating carriage micrometer.

Unit III GEAR MEASUREMENT AND LASER INTERFEROMETER L 9 T 0

Gear measurement – gear tooth vernier, gear tester, surface finish measurement - Roundness measurement - Applications. Basic concept of laser advantages of laser in metrology - laser Interferometers – types - DC and AC Lasers interferometer

Unit IV MEASUREMENT SYSTEMS AND CMM L 9 T 0

Force: Torsion-bar Dynamometer, Servo controlled Dynamometer- Temperature: bimetallic strip, thermocouples, thermometer- Flow measurement: Venturi meter, Orifice meter - Basic concept of Coordinate measuring machine (CMM) - Constructional features - types, applications.

Unit V NANOMETROLOGY L 9 T 0

Importance of Nano metrology-Microscopy: Transmission Electron Microscope-Scanning Electron Microscope-Scanning tunneling microscope-Atomic force microscope-X-ray Diffraction system (XRD).

Total Number of hours: 45

Learning Resources

Text Books

1. Raghavendra N V and Krishnamurthy.L "Engineering Metrology and Measurements",Oxford University Press, 2017.
2. Jain R.K., "Engineering Metrology", Khanna Publishers, 2009

Reference Books

1. Gupta S.C, "Engineering Metrology", Dhanpat rai Publications, 2005
3. Jayal A.K, "Instrumentation and Mechanical Measurements", Galgotia Publications 2000
4. Bewoor "Metrology & Measurement" Tata McGraw-Hill Education, 2009
5. Bucher and Jay L "The Metrology Handbook, Hardcover, 2012
6. Alan S. Morris, "The Essence of Measurement", Prentice Hall of India, 2001

Course Code	U15ME605	L	T	P	C
Course Name	COMPUTER AIDED DESIGN AND ANALYSIS LABORATORY	0	0	4	2

Pre-requisites subject: Computer aided drafting laboratory, Strength of material and Heat & Mass transfer.

Course Outcomes

Upon completion of this course the students will be able to

CO1	Explain the capability Code of practice for Engineering Drawing BIS specifications – Welding symbols riveted joints keys and fasteners.
CO2	Describe Drawing Editing Dimensioning Plotting Commands Layering concepts Limits Fits and Tolerances.
CO3	Draw Orthographic views of standard machine components: Brackets V Blocks Stop Block Screw threads and Threaded fasteners.
CO4	Create 3D modeling of Flange coupling Plummer block bearing Universal Joint Machine vice and stuffing box.
CO5	Use ANSYS to analyze the structure of bar rod truss and beam Evaluate modal harmonic analysis of beams and heat transfer of 2D components.

LIST OF EXPERIMENTS

1. Design Modeling and Analysis (static) of Lifts and Elevators.

1.1. Design of rope.

Selection of rope – calculation of design load – selection of wire diameter – calculation of drum diameter – selection of weight of rope – calculation of various load - calculation of effective load on the rope - calculation of working F.O.S – number of ropes.

Analysis of rope – Modeling of rope – meshing – material selection – boundary condition – result.

1.2. Design of rope drum.

Design of rope drum – length of the drum – wall thickness of drum – flange diameter of rope drum – maximum bending stress – maximum crushing stress – maximum shear stress – total normal stress.

Analysis of rope drums – Modeling of rope drum – meshing – material selection – boundary condition – result.

1.3. Design of V-belt drive.

Selection of belt section – selection of pulley diameter – selection of centre distance – determination of nominal pitch length – selection of various modification factors – correction factor of arc contact – service factor – maximum power capacity – number of belt –calculation of actual centre distance – dimensions of standard V-grooved pulley –

Analysis of V-belt drive – Modeling of V-belt drives – meshing – material selection – boundary condition – result.

1.4. Design of shaft.

Calculation of torque –determining the tensions at pulley – bending moment – equivalent twisting moment – equivalent bending moment – power of shaft – selection of bearing.

Analysis of shaft – Modeling of shaft – meshing – material selection – boundary condition – result.

2. Design and Analysis (Dynamic) of Defense vehicle's gear box.

Selection of spindle speeds – ray diagram – kinematic arrangement – calculation of number of teeth – material selection – calculation of module – calculation of center distance of shaft – design of shaft.

Analysis of gear – modeling of gear – meshing of gear – material selection – boundary condition – result.

3. Design and analysis (natural frequency and vibration/shock response) of Missiles and Air force flying machines.

Design of landing gear component Analysis of landing gear component – import modeling – meshing – boundary condition – review result.

4. Thermal analysis of Electrical & Electronic device heat sink and heat exchanger.

Modeling of heat exchanger – find variable material – meshing of exchanger – thermal boundary conditions – to find heat dissipations & heat flow - review results.

Total Hours 45

List of Experiments:

1. Design and analysis of elevator (Rope, Drum, V – belt, Shaft).
2. Design and analysis of gear box (8, 12, 14, 18 Speed gear box).
3. Design and harmonic analysis of air force landing gear.
4. Thermal analysis of laptop heat sink and heat exchanger.
5. Thermal analysis of copper shell tube heat exchanger in radiator.

Modeling Software	**Analysis Software**
Required - 50 user	Required - 50 user
Solid works – 100 users	ANSYS – 100 users

Course Code	**U15ME606**	L	T	P	C
Course Name	**METROLOGY AND MEASUREMENTS LABORATORY**	0	0	4	2

Pre-requisites subject: Physics Lab I & II

Course Outcomes

Upon completion of this course the students will be able to

CO1	Know the fundamentals of general Measurement system, Calibration methods and Errors in Measurement.
CO2	Measure the Linear and Angular parameters using various devices for measuring and checking.
CO3	Know the screw thread terminology, errors in threads, measurement of various elements of thread, Gear and their types, gear terminology, measurement and checking of straightness and flatness using auto-collimator
CO4	Work on the various precision instruments like profile projector, comparators and coordinate measuring machine.
CO5	Know the procedure for measurement of force, power, torque, flow and temperature.

LIST OF EXPERIMENTS **Total Hours 45**

1. Calibration of Vernier, Micrometer and Dial Gauge
2. Checking Linear Dimensions of a part using slip gauges
3. Measurement of Taper Angle using sine bar / bevel protractor
4. Measurement of cutting tool parameters using tool makers microscope
5. Measurement of straightness and flatness using auto-collimator
6. Measurement of thread parameters using Profile projector and Floating carriage micrometer
7. Checking the limits of dimensional tolerances using comparators (Mechanical / Pneumatic / Electrical)
8. Measurement of Temperature using Thermocouple / Pyrometer
9. Measurement of Force using load cell / proving ring
10. Measurement of Gear tooth dimensions using Gear Tooth Vernier
11. Study of Displacement using Strain Gauge / LVDT / Wheatstone Bridge
12. Study of torque using torque sensor

List of Equipment's (for a batch of 30 students)

1. Micrometer and Dial Gauge
2. Vernier Caliper, Vernier Height Gauge, Vernier Depth Gauge
3. Sine Bar and Slip Gauge Set
4. Bevel Protractor
5. Tool Makers Microscope
6. Autocollimator
7. Profile Projector
8. Floating Carriage Micrometer
9. Mechanical and Pneumatic Comparator
10. Temperature Measuring Setup
11. LVDT-Displacement Measuring Setup
12. Load cell -Force Measuring Setup
13. Torque Measuring Setup
14. Gear Teeth Vernier

		L	T	P	C
Course Code	**U15ME607**				
Course Name	**TURBO MACHINES LABORATORY**	0	0	4	2

Course Outcomes

Upon completion of this course the students will be able to

CO1 Analyze the performance of the various pumps and turbines (Pelton, Francis and Kaplan turbine).

CO2 Conducting performance test on centrifugal blower.

CO3 Discuss the Performance test on Turbo alternator plant.

Total Number of hours: 45

LIST OF EXPERIMENTS

1. Conducting experiments and drawing the characteristic curves of centrifugal pump / submersible pump
2. Conducting experiments and drawing the characteristic curves of Gear pump.
3. Conducting experiments and drawing the characteristic curves of Pelton wheel.
4. Performance Test on Steam Boiler.
5. Conducting experiments and drawing the characteristics curves of Francis turbine.
6. Conducting experiments and drawing the characteristic curves of Kaplan turbine.
7. Performance test on centrifugal blower.
8. Performance test on Turbo alternator plant.

List of Equipments (for a batch of 30 students)

1. Centrifugal pump/submersible pump setup
2. Gear pump setup
3. Pelton wheel turbine setup
4. Francis turbine setup
5. Kaplan turbine setup
6. Steam Turbine Test Rig
7. Centrifugal Blower Test Rig.
8. Revomax Boiler Model RXA-06.

		L	T	P	C
Course Code	**U15ME907**				
Course Name	**GAS DYNAMICS AND JET PROPULSION**	3	0	0	3

Pre-requisites subject: Engineering Thermodynamics, Fluid Mechanics and Machinery, Thermal Engineering

Course Outcomes

Upon completion of this course the students will be able to

CO1 Describe the basic concepts of compressible fluid flow with respect to various flow regions and importance of Mach Number on change in compressible fluid properties when it flows through constant area duct.

CO2 Explain the concept of compressible fluid flow through path which change in cross section like nozzle and diffuser and also flow with friction.

CO3 Analyse the variation in fluid properties considering heat transfer in flow when flow through constant area duct.

CO4 Evaluate the kinds of shock phenomena while the deviation in flow properties.

CO5 Apply the concepts of gas dynamics in propulsion systems.

Unit I COMPRESSIBLE FLOW – FUNDAMENTALS L 9 T 0

Energy and momentum equations for compressible fluid flows, various regions of flows, reference velocities, stagnation state, velocity of sound, critical states, mach number, critical Mach number, types of waves, Mach cone, Mach angle, effect of Mach number on compressibility.

Unit II FLOW THROUGH VARIABLE AREA DUCT L 9 T 0

Isentropic flow through variable area ducts, T-s, h-s diagrams for nozzle and diffuser flows, area ratio as a function of Mach number, mass flow rate through nozzles and diffusers, effect of friction in flow through nozzles.

Unit III FANNO AND RAYLEIGH FLOW L 9 T 0

Flow in constant area ducts with friction (Fanno flow) - Fanno curves and Fanno equation, variation of flow properties, variation of Mach number with duct length. Isothermal flow with friction in constant area ducts – Flow in constant area ducts with heat transfer (Rayleigh flow), Rayleigh line and Rayleigh flow equation, variation of flow properties, maximum heat transfer.

Unit IV NORMAL SHOCK L 9 T 0

Governing equations, variation of flow parameters like static pressure, static temperature, density, stagnation pressure and entropy across the normal shock, Prandtl-Meyer equation, impossibility of shock in subsonic flows, flow in convergent and divergent nozzle with shock, normal shock in Fanno and Rayleigh flows, flows with oblique shock (elementary treatment only).

Unit V PROPULSION L 9 T 0

Aircraft propulsion- types of jet engines-energy flow through jet engines, study of turbojet engine components-diffuser, compressor, combustion chamber, turbine and exhaust systems, performance of turbo jet engines-thrust, thrust power, propulsive and overall efficiencies, thrust augmentation in turbo jet engines, ram jet and pulse jet engines.

Total Number of hours: 45

Learning Resources

Text Books

1. Yahya.S.M., 'Fundamentals of Compressible flow" , New Age International (P) Ltd., NewDelhi, 1999
2. Rathakrishnan.E, "Gas Dynamics", Prentice Hall of India, New Delhi, 2001.

Reference Books

1. Patrich.H.Oosthvizen, Willam E.Carscallen, "Compressible fluid flow", McGraw-Hill, 1997.
2. Cohen. H., Rogers R.E.C and Sravanamutoo, "Gas turbine theory", Pearson Education Asia, 2005.
3. Ganesan .V., "Gas Turbines", Tata McGraw-Hill, New Delhi, 2002.
4. Zucker,R.D. and Biblarz,O., Fundamentals of Gas Dynamics,2nd ed., John Willey, 2002.

Course Code	**U15ME909**	L	T	P	C
Course Name	**DESIGN OF JIGS, FIXTURES AND PRESS TOOLS**	3	0	0	3

Pre-requisites subjects: Manufacturing Technology-I & II, Design of Machine Elements.

Course Outcomes

Upon completion of this course the students will be able to

CO1 Explain the fundamental concepts and various elements in Tool design and discuss different materials and devices, state the features of Jigs and fixture mechanisms, pneumatic and hydraulic actuators and discuss different forces analyzed in clamping.

CO2 Explain the fundamental components and working principles of Jigs and its types. Outline the working principle and characteristic of various parts with its real time applications.

CO3 Design the fixture for the machines such as lathe, milling machine, Planner, boring and broaching. Also design the fixtures for grinding, shaping, welding and planning operations for a given component.

CO4 Design the fundamental and working principle of press tools, Dies and its accessories.

CO5 Design and develop the progressive dies, compound dies and bending dies for blanking operations. Also develop the drawing of dies.

Unit I Purpose Types and Functions of Jigs and Fixtures L 9 T 0

Tool design objectives - Production devices - Inspection devices - Materials used in Jigs and Fixtures – Types of Jigs - Types of Fixtures-Mechanical actuation-pneumatic and hydraulic actuation-Analysis of clamping force- Tolerance and error analysis.

Unit II Jigs L 9 T 0

Drill bushes –different types of jigs-plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs- Automatic drill jigs-Rack and pinion operated - Air operated Jigs components - Design and development of Jigs for given components.

Unit III Fixtures L 9 T 0

General principles of boring, lathe, milling and broaching fixtures- Grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures- Modular fixtures. Design and development of fixtures for given component.

Unit IV Press working L 9 T 0

Press Working Terminologies and Elements of Dies and Strip Layout Press working terminology-Presses and press accessories-Computation of capacities and tonnage requirements - Elements of progressive combination and compound dies: Die block-die shoe - Bolster plate-punch holder-guide pins and bushes – strippers – knockouts-stops –pilots.

Unit V Design and Development of Dies L 9 T 0

Design and development of progressive and compound dies for Blanking and piercing operations. Bending dies – development of bending dies-forming and drawing dies-Development of drawing dies. Design considerations in forging, extrusion, casting and plastic dies.

Total Number of hours: 45

Learning Resources

Text Books:

1. Edward G Hoffman, "Jigs & Fixture Design", Thomson – Delmar Learning, Singapore 2004.
2. Joshi, P.H. "Jigs and Fixtures", Second Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2004.
3. Donaldson, Lecain and Goold "Tool Design", III rd Edition Tata McGraw Hill, 2000.

Reference Books

1. K. Venkataraman, "Design of Jigs Fixtures & Press Tools", Tata McGraw Hill, New Delhi, 2005.
2. Hiram E Grant, "Jigs and Fixture" Tata McGraw-Hill, New Delhi, 2003.
3. ASTME Fundamentals of Tool Design, Prentice Hall of India.
4. Design Data Handbook PSG College of Technology, Coimbatore.

Course Code	**U15ME911**	L	T	P	C
Course Name	**COMPOSITE MATERIALS AND MANUFACTURING**	3	0	0	3

Pre-requisites subjects: Engineering materials and metallurgy, Manufacturing technology.

Course Outcomes

Upon completion of this course the students will be able to

CO1 To study matrix material, reinforcements of polymer matrix composites, MMC and ceramic matrix composites.

CO2 Use of different techniques to process different types of composites and know the limitations of each process.

CO3 To develop knowledge on joining, machining and recycling process of composites.

CO4 To understand properties of ceramic matrix composites and processing of ceramic matrix composites.

CO5 To study about joining , recycling and machining of composites.

Unit I INTRODUCTION TO COMPOSITES L 9 T 0

Fundamentals of composites - need for composites – enhancement of properties – classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – particle reinforced composites, Fibre reinforced composites. Applications of various types of composites. Fiber production techniques for glass, carbon and ceramic fibers.

Unit II POLYMER MATRIX COMPOSITES L 9 T 0

Polymer resins – thermosetting resins, thermoplastic resins – reinforcement fibres – rovings –woven fabrics – non woven random mats – various types of fibres. PMC processes - hand layup processes – spray up processes – compression moulding – reinforced reaction injection moulding - resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass Fibre Reinforced Plastics (GFRP). Laminates-applications of PMC in aerospace, automotive industries

Unit III METAL MATRIX COMPOSITES L 9 T 0

Characteristics of MMC, various types of metal matrix composites alloy vs. MMC, advantages of MMC, limitations of MMC, Reinforcements – particles – fibres. Effect of reinforcement – volume fraction – rule of mixtures. Processing of MMC – powder metallurgy process - diffusion bonding – stir casting – squeeze casting, Liquid infiltration In-situ reactions-Interface- measurement of interface properties- applications of MMC in aerospace, automotive industries.

Unit IV CERAMIC MATRIX COMPOSITES L 9 T 0

Engineering ceramic materials – properties – advantages – limitations – monolithic ceramics - need for CMC – ceramic matrix - various types of ceramic matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Processing of Ceramic Matrix composites: Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Carbon /carbon composites – processing- advantages of carbon matrix – limitations of carbon matrix carbon, Sol-gel technique-, applications of CMC in aerospace, automotive industries.

Unit V JOINING AND RECYCLING OF COMPOSITIES L 9 T 0

Joining: Adhesive Bonding- Basic Science of Adhesive Bonding-Types of Adhesives- Advantages of Adhesive Bonding over Mechanical Joints- Mechanical Joints. Machining and Cutting of Composites: Challenges during Machining of Composites- Cutting Tools- Types of Machining Operations- Water-jet Cutting, Laser Cutting. Recycling of Composites: Recycling Methods- Regrinding, Pyrolysis.

Total Number of hours: 45

Learning Resources

Text Books:

1. Mathews F. L. and Rawlings R. D., “Composite Materials: Engineering and Science”, Chapman and Hall, London, England, 1st edition, 1994.
2. Chawla K. K., “Composite materials”, Springer – Verlag, Second Edition, 1998.
1. Sanjay K. Mazumdar, “Composites Manufacturing**,** Materials, Product, and Process Engineering”, CRC Press.

References:

1. Clyne, T. W. and Withers, P. J., “Introduction to Metal Matrix Composites”, Cambridge University Press, 1993.
2. Strong, A.B., “Fundamentals of Composite Manufacturing”, SME, 1989.
3. Sharma, S.C., “Composite materials”, Narosa Publications, 2000.
4. Broutman, L.J. and Krock,R.M., “ Modern Composite Materials”, Addison-Wesley, 1967.
5. ASM Hand Book, “ Composites”, Vol.21, ASM International, 2001.

		L	T	P	C
Course Code	**U15ME913**				
Course Name	**SURFACE ENGINEERING**	3	0	0	3

Pre-requisites subjects: NIL

Course Outcomes

Upon completion of this course the students will be able to

CO1 Explain the important of surface engineering to industries

CO2 Use of thermal spray for coating

CO3 Explain the process and mechanism of different diffusion coating process

CO4 Explain the methods of non metallic coating

CO5 Explain the testing procedure for quality assurance.

Unit I **METAL CLEANING AND PREVIEW ON SURFACE ENGINEERING** L 9 T 0

Need and relevance of surface engineering – pre-treatment of coating. General cleaning process for ferrous and non ferrous metals and alloys – selection processes – alkaline cleaning – emulsion cleaning – ultrasonic cleaning – acid and pickling salt bath descaling – abrasive bath cleaning – polishing and bulling shot peening – classification of surface engineering processes.

Unit II **THERMAL SPRAYING PROCESSES AND ELECTRODEPOSITED COATINGS** L 9 T 0

Thermal spraying – Flame, arc, plasma and HVOF processes – PLV process – Design for thermally sprayed coatings – coating production – Spray consumables – principles of electroplating – Technology and control – electroplating systems – properties and Faraday's Law – factors affecting throwing power – Applications of electrodeposites – non aqueous and electroless deposition.

Unit III **HOT DIP COATING AND DIFFUSION COATINGS** L 9 T 0

Principles – surface preparation – batch coating and continuous coating process – coating properties and applications. Principles of cementation – cladding – Diffusion coating of C, N, Al, Si, Cr and B – structure, properties and application of diffusion coatings – chemical vapour deposition – physical vapour deposition.

Unit IV NON-METALLIC COATING OXIDE AND COVERSION COATINGS L 9 T 0

Plating coating – Lacquers – rubbers and elastomers – vitreous enamels – anodizing phosphating and chromating – application to aluminium, magnesium, tin, inc, cadmium copper and silver – phosphating primers.

Unit V QUALITY ASSURANCE, TESTING AND SELECTION OF COATINGS L 9 T 0

The quality plan – design – testing and Inspection of thickness adhesion, corrosion, resistance and porosity measurement – selection of coatings – industrial applications of engineering coatings. Basic Mechanisms of wear – abrasive, adhesive wear, contact fatigue – Fretting corrosion – Testing wear resistance – practical diagnosis of wear.

Total Number of hours: 45

Learning Resources

Text Books

1. Stan Grainger engineering coatings – design and application Jaico publishing House, 1994.

Reference Books

1. N.V. Parthasarathy, Electroplating Handbooks, Prentice Hall, 1992.
2. Metals Hand Book vol.2 8 Edition, American society of Metals, 1994
3. D.R.Gabe, Principles of Metal surface treatment and protection, Pergamon, 1990
4. Niku-Lavi, Advances in surface treatments, Pergamon, 1990

		L	T	P	C
Course Code	**U15ME915**				
Course Name	**MICRO ELECTRO MECHANICAL SYSTEMS**	3	0	0	3

Pre-requisites subjects: Engineering materials and CAD/CAM/CIM

Course Outcomes

Upon completion of this course the students will be able to

CO1 Understand the knowledge of semiconductors and solid mechanics to fabricate MEMS devices.

CO2 Understand the knowledge of Classify sensors and actuators.

CO3 Understand the knowledge of Analyse sensors and actuators

CO4 Understand the knowledge of various micromachining techniques

CO5 Understand the knowledge of various polymer and optical MEMS.

Unit I INTRODUCTION L 9 T 0

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

Unit II SENSORS AND ACTUATORS-I L 9 T 0

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys.

Unit III SENSORS AND ACTUATORS-II L 9 T 0

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

Unit IV MICROMACHINING L 9 T 0

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundry process.

Unit V LENS & Rapid Tooling L 9 T 0

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

Total Number of hours: 45

Learning Resources

Text Books

1. Chang Liu, "Foundations of MEMS", Pearson Education Inc., 2006.
2. Stephen D Senturia, "Microsystem Design", Springer Publication, 2000.
3. Tai Ran Hsu, “MEMS & Micro systems Design and Manufacture” Tata McGraw Hill, New Delhi, 2002.

Reference Books

1. Nadim Maluf,“ An Introduction to Micro Electro Mechanical System Design”, Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, “ The MEMS Handbook”, CRC press Baco Raton, 2000
3. Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, "Micro Sensors MEMS and Smart Devices", John Wiley & Son LTD,2002
4. James J.Allen, "Micro Electro Mechanical System Design", CRC Press Publisher, 2010
5. Thomas M.Adams and Richard A.Layton, “Introduction MEMS, Fabrication and Application,” Springer 2012.

Semester –VI	U15GE601B :SOFT SKILLS AND APTITUDE -IV	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 job-oriented company selection processes using the hands-on approach

2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests

3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in placement specific internal tests

1. Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. Mock group discussions b. Mock interviews c. Mock stress interviews
2. Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Progressions b. Heights and Distances c. Simple Interest d. Compound Interest e. Calendars f. Area and Perimeter g. Volume and Surface Area h. Boats and Streams i. Data Interpretation j. Puzzles k. Artificial Language l. Mathematical Operators m. Statement and Conclusion n. Data Sufficiency o. Geometry p. Company specific aptitude questions
3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Story a story for given pictures g. Company specific aptitude questions

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15EE601	Power System Protection and Switchgear	3	0	0	3
2	U15EE602	Power System Analysis	2	2	0	3
3	U15EE603	Solid State Drives	3	0	0	3
4	U15EE908	**Elective-**Bio Medical Instrumentation	3	0	0	3
5	U15EE909	**Elective** -Renewable Energy Sources	3	0	0	3
6	**Open Elective**		3	0	0	3
	U15CS1001	Internet of Things				
	U15CS1003	Object Oriented Programming and Data Structures				
	U15ME1003	Industrial Safety				
	U15CE1001	Building Services and Safety Regulations				
Practical						
7	U15EE604	Solid State Drives Laboratory	0	0	4	2
8	U15ENG601	Communication Skills Laboratory	0	0	2	1
9	U15GE603	Technical Seminar	0	0	2	1
10.	U15GE601B	Soft Skills and Aptitude – IV	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, Sixth Semester BE EEE Students and Staff, COE

U15EE601 POWER SYSTEM PROTECTION AND SWITCHGEAR 3 0 0 3

COURSE OUTCOMES:

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

1. Discuss the need for the protection and various digital protection schemes and analyse relay characteristics.
2. Discuss protection schemes of generator, transformer, bus bars and transmission lines.
3. Describe the method of circuit breaking, arcing phenomena – various arc theories – capacitive and inductive breaking.
4. Discuss the modern trends in protection and working of different types of circuit breakers.
5. Describe the methods of protection against over voltages and insulation co-ordination in power system.

UNIT I RELAYS 9

Need for protection – essential qualities of protective relays – over current relays directional, distance and differential, under frequency, negative sequence relays – static relays – microprocessor – based relays. – Digital filtering in protective relays – relays algorithms –Impedance relay, MHO relay – quadrilateral relay.

UNIT II APPARATUS PROTECTION 9

Apparatus protection – generator and transformer protection – protection of bus bars, transmission lines, CTs & PTs and their application in protective schemes.

UNIT III THEORY OF ARC QUENCHING 9

Physics of arc phenomena and arc interruption – re-striking voltage & recovery voltage, rate of rise of recovery voltage, current chopping, interruption of capacitive current, resistance switching – DC circuit breaking.

UNIT IV MODERN TRENDS IN PROTECTION AND CIRCUIT BREAKER 9

Carrier current pilot relaying – phase comparison, carrier aided distance protection – travelling wave relays – amplitude comparison relay, phase comparison relay – fibre optic based relaying. switchgear – fault clearing and interruption of current – types of circuit breakers: vacuum circuit breakers, SF_6 circuit breakers, oil circuit breakers and air circuit breakers – selection of circuit breakers – intelligent circuit breakers.

UNIT V PROTECTION AGAINST OVER VOLTAGES 9

Causes of over voltages – methods of protection against over voltages – ground wires, Peterson coil, surge absorbers, surge diverters – relay co-ordination – selection of Protective system – Insulation co-ordination.

Lecture: 45; Tutorial: 0; TOTAL: 45 Hours

TEXT BOOKS:

1. Ravindranath.B and Chander.N, "Power System Protection and Switchgear", New Age international Publishers, 2011.
2. Badri Ram and B.H.Vishwakarma, "Power System Protection and Switchgear", Tata McGraw Hill Education Pvt. Ltd, 2013.

REFERENCES:

1. Chakrabarti.A, Soni.M.L, Bhatnagar.U.S., Gupta.P.V, "A text book on Power System Engineering", Dhanpatrai & Co. pvt. ltd., 2013.
2. C.L. Wadhwa, "Electrical Power Systems", New Age International (P) Ltd., 2016.
3. Ravindra P.Singh , " Digital Power System Protection" , PHI , New Delhi, 2007.
4. Sunil S. Rao, "Switchgear and Protection", Khanna Publishers, 13th Edition, 2015.

U15EE602 POWER SYSTEM ANALYSIS 2 2 0 3

COURSE OUTCOMES:

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

1. Model the various power system components and to draw the reactance diagram for practical power system networks.
2. Solve the power flow equation for power system networks using iterative solution techniques.
3. Carry out symmetrical fault analysis for power system networks using bus impedance matrix formulation.
4. Carry out unsymmetrical fault analysis for various power system networks using symmetrical components.
5. Model the power system for stability analysis and to solve the swing equation using modified Euler's and Runge-Kutta methods.

UNIT I POWER SYSTEM – AN OVERVIEW AND MODELLING 9

Need for system analysis in planning and operation of power system – modelling of synchronous generator and motor, transformer and transmission line – per unit system– change of base – impedance and reactance diagrams.

UNIT II POWER FLOW ANALYSIS 15

Primitive network and network matrices – Y-bus formulation by direct inspection and singular transformation methods – problem definition – bus classification – derivation of power flow equation – power flow solution by Gauss Seidel – computation of slack bus power, transmission loss and line flow – Newton Raphson and fast decoupled methods (qualitative treatment only) comparison of solution techniques.

UNIT III SYMMETRICAL FAULT ANALYSIS 12

Need for short circuit study – approximations in modelling – fault MVA – symmetrical short circuit analysis – Thevenin's equivalent representation –bus impedance matrix formulation – bus building algorithm – symmetrical fault calculations using bus impedance matrix.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 12

Unsymmetrical fault analysis – symmetrical component transformation – sequence impedances – sequence networks – types of unsymmetrical fault – unsymmetrical fault analysis on an unloaded generator – unsymmetrical fault analysis on power system.

UNIT V STABILITY ANALYSIS 12

Concept of stability in power system – steady and transient state stability – rotor angle stability–voltage stability – swing equation – power angle equation and curve – equal area criterion – critical clearing angle and time – solution of swing equation by modified Euler's method and Runge-Kutta method (qualitative treatment only).

Lecture: 30, Tutorial: 30, TOTAL: 60 Hours

TEXT BOOKS:

1. Nagrath.I.J, Kothari.D.P, "Modern Power System Analysis", Tata McGraw Hill,3rd Ed., 2003.
2. Hadi Saadat, "Power System Analysis", Tata McGraw Hill Pub Co. Ltd., New Delhi, 2002.
3. John J.Grainger and Stevenson Jr.W.D., "Power System Analysis", Tata McGraw, 1st Ed., 2003.

REFERENCES:

1. Gupta, J.B., “A Course in Electrical Power”, S.K.Kataria and Sons, 2009.
2. Abhijit Chakrabarti, Sunita Halder, “Power System Analysis: Operation and Control”, 2nd Edition, Prentice Hall of India Learning Private Limited, 2008.
3. Stagg.G.W, and El-Abaid.A.H., “Computer Methods in Power System Analysis”, Tata McGraw Hill Pub Co. Ltd, New Delhi, 1993.

U15EE603 SOLID STATE DRIVES 3 0 0 3

COURSE OUTCOMES:

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

1. Describe the steady state operation and transient dynamics of a motor load system.
2. Analyse the operation of the converter and chopper fed DC drives.
3. Discuss the operation of solid state speed control of induction motor.
4. Discuss the performance of solid state speed control of synchronous motor.
5. Describe the stepper motor, solar pump drive and battery powered electric vehicle.

UNIT I REVIEW OF ELECTRIC DRIVES 9

Electric drives – advantage of electric drives – selection of motor power rating – thermal model of motor for heating and cooling – classes of duty cycle – determination of motor rating four quadrant operations – starting, braking and reversing operations.

UNIT II SOLID STATE CONTROL OF DC DRIVES 9

Single-phase and three-phase converter fed drives – continuous and discontinuous conduction modes – chopper fed drives – four-quadrant operation – closed loop drive system.

UNIT III SOLID STATE CONTROL OF INDUCTION MOTOR 9

Induction motor drives – stator control – stator voltage and frequency control – AC chopper, inverter and cyclo-converter fed induction motor drives – rotor control – rotor resistance control and slip power recovery scheme.

UNIT IV SOLID STATE CONTROL OF SYNCHRONOUS MOTOR 9

Variable speed drives – variable frequency control – self-controlled synchronous motor – inverter fed synchronous motors – cyclo-converter fed synchronous motor – brushless DC motor drives.

UNIT V STEPPER MOTOR, SOLAR AND ELECTRIC VECHICLE DRIVES 9

Stepper motor – variable reluctance – permanent magnet – features of stepper motors – torque vs stepping rate characteristics – driver circuits – solar panels – motor suitable for pump drives – solar powered pump drives – drive for hybrid electric vehicles.

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Lecture: 45, Tutorial: 0, TOTAL: 45 Hours

TEXT BOOKS:

1. Gopal K Dubey, “Fundamentals of Electric Drive”, Narosa Publications, II Edition, 2002**.**
2. Bimal K.Bose, “Modern Power Electronics and AC Drives”, Prentice Hall of India, 2005.

REFERENCES:

1. Pillai.S.K., “A first course on Electrical Drives”, New Age International (P) Ltd., 1984.
2. Vedam Subramanyan, “Thyristor control of Electrical Drives”, Tata McGraw Hill, 1996.
3. Sen P.C., “Thyristor Drives”, John Wiley & sons, New York, 1993.

U15EE604 SOLID STATE DRIVES LABORATORY 0 0 4 2

COURSE OUTCOMES:

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

1. Simulate AC and DC drives using power electronics modules and the performance characteristics of AC, DC and special drives.
2. Analyse the speed control using microcontroller, DSP and PLC based control of VFD.
3. Analyse the performance parameters of electrical drives.

LIST OF EXPERIMENTS:

1. Simulation of closed loop control of converter fed DC motor.
2. Simulation of closed loop control of chopper fed DC motor.
3. Simulation of VSI fed 3 Phase Induction motor.
4. Simulation of 3-Phase Synchronous motor drive.
5. Speed control of stepper motor using microcontroller.
6. Design of DSP based closed drive for induction motor..
7. Analysis of converter fed DC drive.
8. Study of PLC based drives.
9. Analysis of DSP based chopper fed DC drives.
10. Speed control of Brushless DC motor.
11. Speed control of 3 Phase Induction motor using PWM inverter.
12. Speed control of PMSM motor drive using FPGA
13. Speed control of Switched reluctance motor drive using DSP.

Total: 45 Hours

U15EE908 BIO MEDICAL INSTRUMENTATION 3 0 0 3

COURSE OUTCOMES:

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

1. Outline the function of various systems of body and sketch basic components of biomedical system and explain principle of operation of various transducers used for physiological measurements.
2. Illustrate various electrodes and amplifiers used in physiological measurements and Describe safety parameters and the Lead system, recording methods of ECG, EEG, EMG and ERG.
3. Explain the methods to measure non-electrical parameters with block diagram.
4. Describe the imaging techniques and outline the requirements of biotelemetry and its elements.
5. Explain the basic blocks and working of assisting and therapeutic equipment.

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Cell and its structure – resting and action potential –functional organization: nervous system – cardiovascular system – respiratory system – basic components of a biomedical system – transducers – selection criteria – piezo electric, ultrasonic transducers – temperature measurements – fibre optic temperature sensors.

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9

Electrodes – limb electrodes – floating electrodes – pregelled disposable electrodes – micro, needle and surface electrodes – amplifiers: preamplifiers, differential amplifiers, chopper amplifiers – isolation amplifier.

ECG – EEG – EMG – ERG – lead systems and recording methods – typical waveforms. Electrical safety in medical environment: shock hazards – leakage current – instruments for checking safety parameters of biomedical equipment.

UNIT III NON – ELECTRICAL PARAMETER MEASUREMENTS 9

Measurement of blood pressure – cardiac output – heart rate – heart sound – pulmonary function measurements – spirometer – photo plethysmography – body plethysmography – blood gas analysis: PH of blood – measurement of blood pCO_2, pO_2, finger – tip oxymeter – ESR, GSR measurements.

UNIT IV MEDICAL IMAGING 9

Radio graphic and fluoroscopic techniques – computer tomography – MRI – ultrasonography – endoscopy – thermography.

Biotelemetry – requirements – physiological parameters adaptable – elements of biotelemetry – implantable biotelemetry – telemedicine – tele surgery – introduction to biometric systems.

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

Pacemakers – defibrillators – ventilators – nerve and muscle stimulators – diathermy – heart-lung machine – audio meters – dialysers – lithotripsy.

Lecture: 45; Tutorial: 0; TOTAL: 45 Hours

TEXT BOOKS:

1. Kandpur, R.S., “Handbook of Biomedical Instrumentation”, Mcgraw Education (India) Private limited, 2016.
2. M.Arumugam, “Bio – Medical Instrumentation”, Anuradha Agencies, 2003.

REFERENCES:

1. Richard Aston, “Principles of Biomedical Instrumentation and Measurement”, Merrill publishing company, 1990.
2. Leslie Cromwell, “Biomedical Instrumentation and measurement”, PHI, 2002.
3. L.A.Geddes and L.E.Baker, “Principles of Applied Bio – Medical Instrumentation”, John Wiley & Sons, 1975.
4. C.Rajarao and S.K.Guha, “Principles of Medical Electronics and Bio – medical Instrumentation”, Universities press (India) Ltd., Orient Longman Ltd., 2000.

U15EE909 RENEWABLE ENERGY SOURCES 3 0 0 3

COURSE OUTCOMES:

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

1. Illustrate the power demand scenario in world level and impact of various renewable energy sources in satisfying power demand.
2. Explain the different components and to summarize the principle of operation and the application of solar PV system and bio mass power generation system.
3. Outline the components and to find the suitability based on the performance of wind energy conversion system, geo thermal and hydel power system.
4. Describe the components of tidal power generation scheme and wave energy scheme and to discuss the performance of the two systems.
5. Outline the various components and methods of ocean energy conversion system.

UNIT I INTRODUCTION 9

World energy use – reserves of energy resources – energy cycle of the earth – environmental aspects of energy utilization – renewable energy resources and their importance.

UNIT II SOLAR AND BIO ENERGY 9

Introduction – extra-terrestrial solar radiation – radiation at ground level – collectors – solar cells – applications of solar energy – biomass Energy – introduction – biomass conversion – biogas production – ethanol production – pyrolysis and gasification – direct combustion – applications.

UNIT III WIND, GEO THERMAL AND HYDRO ENERGY SOURCES 9

Introduction – wind energy – wind speed and power relation – power extracted from wind – wind distribution and wind speed predictions – types of wind power systems. Geo-thermal energy – types of geothermal energy sites, site selection, and geothermal power plants, hydro energy – feasibility of small, mini and micro hydro plants: scheme, layout and economics.

UNIT IV TIDAL ENERGY 9

Introduction – origin of tides – power generation schemes – wave Energy – basic theory – wave power devices.

UNIT V OTHER RENEWABLE ENERGY SOURCES 9

Introduction – open and closed OTEC cycles – ocean currents – salinity gradient devices – potential impacts of harnessing the different renewable energy resources.

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

TEXT BOOKS:

1. Rai, G.D., “Non-Conventional Energy Sources”, Khanna Publishers.
2. Rao S. Paruklekar, “Energy Technology – Non-Conventional, Renewable and Conventional”, Khanna Publishers.

REFERENCES:

1. F.Kreith and J.F.Kreider, “Principles of Solar Engineering”, McGraw Hill.
2. T.N.Veziroglu, “Alternative Energy Sources”, Vol 5 and 6, McGraw Hill.
3. Mukund R.Patel, “Wind and Solar Power Systems”, CRC Press LLC.

Semester –VI	U15GE601B :SOFT SKILLS AND APTITUDE -IV	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 job-oriented company selection processes using the hands-on approach

2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests

3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in placement specific internal tests

1. Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. Mock group discussions b. Mock interviews c. Mock stress interviews
2. Quantitative Aptitude and **Logical Reasoning**	**Solving problems in the following areas:** a. Progressions b. Heights and Distances c. Simple Interest d. Compound Interest e. Calendars f. Area and Perimeter g. Volume and Surface Area h. Boats and Streams i. Data Interpretation j. Puzzles k. Artificial Language l. Mathematical Operators m. Statement and Conclusion n. Data Sufficiency o. Geometry p. Company specific aptitude questions
3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Story a story for given pictures g. Company specific aptitude questions

U15ENG601 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.

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

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit
Theory							
1	U15EC601	Digital Communication		3	2	0	4
2	U15EC602	Antenna and Wave Propagation		3	2	0	4
3	U15GE601C	Quantitative Aptitude and Reasoning		1	4	0	3
4	U15EC904	**Elective**	Computer Networks	3	0	0	3*
5	U15EC905		Digital Image Processing	3	0	0	3*
6	U15EC906		CMOS VLSI Design	3	0	0	3*

***Any 2 electives to be opted by the student among 3 electives.**

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, Sixth Semester BE ECE Students and Staff, COE

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

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit
Theory							
7	U15CS1001	**Open Elective**	Internet of Things	3	0	0	3
8	U15CS1002		Mobile Application Development				
9	U15IT1001		Basic Data Structures				
10	U15IT1003		Problem Solving Techniques Using Java Programming				
11	U15IT1004		Python Programming				
12	U15ME1002		Industrial Robotics				
13	U15CE1002		Energy Efficiency and Green Building				
Practical							
14	U15EC603	Communication Laboratory		0	0	4	2
15	U15CS605	C++ Laboratory		0	0	4	2
16	U15EC604	Mini Project		0	0	4	2
						Total Credits	**26**

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, Sixth Semester BE ECE Students and Staff, COE

U15EC601	DIGITAL COMMUNICATION	L T P C 3 2 0 4

COURSE OUTCOMES

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

1. Discuss the process of sampling, quantization and coding and fundamentals of digital transmission of analog signals.
2. Describe the baseband pulse transmission, which deals with the transmission of pulse-amplitude, modulated signals in their baseband form.
3. Express pass-band data transmission and compare the performance of various digital modulation systems.
4. Apply the different types of error control coding techniques.
5. Illustrate the methods of spread spectrum modulation.

UNIT I	**PULSE MODULATION** Sampling Process – Signal Distortion in Sampling and Recovery – Pulse Amplitude Modulation – PWM – PPM – Pulse Code Modulation – Noise Considerations in PCM Systems – TDM – Digital Multiplexers – Delta Modulation – Linear Prediction – Differential Pulse Code Modulation – Adaptive Differential Pulse Code Modulation.	**15**
UNIT II	**BASEBAND PULSE TRANSMISSION** Matched Filter – Error Rate Due to Noise – Line Coding Formats – Power Spectra of Discrete PAM Signals – Inter-symbol Interference – Nyquist's Criterion for Distortionless Baseband Binary Transmission – Correlative Level Coding – Base Band M-ary PAM Transmission – Adaptive Equalization – Eye Patterns.	**15**
UNIT III	**PASS BAND DATA TRANSMISSION** Introduction – Pass Band Transmission Model – Generation and Detection – Signal Space Diagram – Bit Error Probability – Power Spectra ff ASK-FSK-PSK -DPSK- QAM-QPSK and MSK Schemes – Comparison of Digital Modulation Systems using a Single Carrier – Carrier and Symbol Synchronization.	**15**
UNIT IV	**ERROR CONTROL CODING** Linear Block Codes – Syndrome Decoding and its Properties – Minimum Distance Considerations – Cyclic Codes – Generator Polynomial – Encoder for Cyclic Codes - Convolutional Codes – Time Domain and Transform Domain Approach – Maximum Likelihood Decoding of Convolutional Codes – Viterbi Algorithm – Trellis Coded Modulation.	**15**
UNIT V	**SPREAD SPECTRUM MODULATION** Pseudo-noise Sequences – Direct Sequence Spread Spectrum with Coherent Binary Phase Shift Keying – Signal Space Dimensionality and Processing Gain –Probability of Error – Frequency – Hop Spread Spectrum – Maximum Length and Gold Codes.	**15**
		Total: 75

TEXT BOOKS

1. Simon Haykin, "*Communication Systems*" Wiley, 4th Edition, 2016.
2. Simon Haykin, "*Digital Communication*" John Wiley, 4th Edition, 2015.

REFERENCE BOOKS

1. Taub and Schilling , "*Principles of Digital Communication*" Tata McGraw-Hill, 28th Reprint 2003
2. Sanjay Sharma ," *Digital Communication,*" Kataria& sons publication, 6th edition, 2013
3. Sam Shanmugam "*Digital and Analog Communication systems*" John Wiley& Sons, 2012
4. B. P. Lathi, Zhi Ding, '*Modern Digital and Analog Communication Systems* Oxford University Press, 2009
5. John G. Proakis, "*Digital Communication*" McGraw Hill , 4th Edition, 2007

U15EC602	ANTENNA AND WAVE PROPAGATION	L T P C 3 2 0 4

COURSE OUTCOMES

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

1. Introduce antenna fundamentals and basic terminologies.
2. Construct array of antenna to obtain different radiation pattern.
3. Outline the working principles of different antenna types.
4. Introduce antenna measurements and identify antenna for special applications.
5. Describe various radio wave propagation methods.

UNIT I	**ANTENNA FUNDAMENTALS AND RADIATION PATTERN** Basic Antenna Parameters – Radiation Patterns – Beam Solid Angle – Radiation Intensity – Gain – Directive Gain – Power Gain – Directivity – Beam Width – Bandwidth – Effective Aperture – Effective Length – Relation Between Effective Length and Effective Area – Reciprocity Principle – Friis Transmission Formula – Retarded Vector Potential – Fields Associated with Hertzian Dipole – Power Radiated and Radiation Resistance of Current Element – Radiation from Half – Wave Dipole and Quarter-Wave Monopole Antennas.	**15**
UNIT II	**ANTENNA ARRAYS** Antenna Arrays – Broad-Side Array – End-Fire Array – Collinear Array and Parasitic Array – Expression for Electric Field from Two and N Element Linear Arrays for Broad-Side and End – Fire Case – Direction of Pattern Maxima -Minima and Beam Width for Broad – Side and End – Fire Case – Method of Pattern Multiplication – Binomial Array.	**15**
UNIT III	**WIDE BAND ANTENNAS** Folded Dipole – Loop Antennas – Radiation from Small Loop and its Radiation Resistance-Helical Antenna – Normal Mode and Axial Mode Operation – Yagi Uda Antenna – Log Periodic Antenna – Rhombic Antenna – Horn Antenna – Reflector Antennas and their Feed Systems – Micro Strip Antenna.	**15**
UNIT IV	**ANTENNA MEASUREMENTS** Measurement of Different Antenna Parameters – Directional Pattern – Gain – Phase – Polarization – Impedance – Efficiency – Antennas for Special Applications – Antenna on Cellular Handsets – GPR – Embedded Antennas – UWB – Plasma Antenna.	**15**
UNIT V	**RADIO WAVE PROPAGATION** Ground Wave Propagation – Attenuation Characteristics for Ground Wave Propagation – Calculation of Field Strength at a Distance – Space Wave Propagation – Duct Propagation – Calculation of Field Strength at a Distance. Sky Wave Propagation – Structure of the Ionosphere – Mechanism of Refraction – Refractive Index – Critical Frequency – Skip Distance – Effect of Earth's Magnetic Field – Attenuation Factor for Ionosphere Propagation – Maximum Usable Frequency – Fading and Diversity Reception.	**15**
		Total: 75

TEXT BOOKS

1. John D. Kraus and Ronalatory Marhefka, "*Antenna*s", Tata McGraw-Hill Book Company, 2010.
2. Balanis, "*Antenna Theory* ", John Wiley and Sons, Second Edition, 2003.

REFERENCE BOOKS

1. Prasad K.D, "*Antennas and Wave Propagation*", Satya prakashan, 2009.
2. Jordan E.C and Balmain, "*Electro Magnetic Waves and Radiating Systems*", PHI, 2011.
3. Collins R.E., "*Antennas and Radio Propagation*", McGraw-Hill, 2003.

U15EC904	COMPUTER NETWORKS	L T P C 3 0 0 3

COURSE OUTCOMES

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

1. To introduce the basic concept in modern data communication and computer networking.
2. To introduce the students the functions of different layers and in depth knowledge of data link layer.
3. To make students to get familiarized with different protocols and network layer components
4. To introduce the basic functions of transport layer and congestion in networks.
5. To understand the concepts of various network Applications and Data security.

UNIT I	**DATA COMMUNICATIONS** Components – Direction of Data Flow – Networks – Components and Categories – Types of Connections – Topologies – Protocols and Standards – ISO / OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing Sequences.	**9**
UNIT II	**DATA LINK LAYER** Error – Detection and Correction – Parity – LRC – CRC – Hamming code – Flow Control and Error control – Stop and Wait – Go Back N ARQ – Selective Repeat ARQ – Sliding Window Techniques – HDLC – LAN – Ethernet IEEE 802.3 – IEEE 802.4 and IEEE 802.5 – IEEE 802.11–FDDI – SONET – Bridges.	**9**
UNIT III	**NETWORK LAYER** Internet Works – Packet Switching and Datagram Approach – IPv4 and IPv6 – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.	**9**
UNIT IV	**TRANSPORT LAYER** Duties of Transport Layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of Services (QOS) – Integrated Services.	**9**
UNIT V	**APPLICATION LAYER** Principles of Network Application – Domine Name Space (DNS) – SMTP – FTP – HTTP – E-Mail – The WEB – Principles of Cryptography – Message Integrity – End Point Authentication – Security Email – Network Layer Security – Modes – Security Protocol – IKE – VPN – Transport Layer Security – SSL Architecture – Application Layer Security – E-mail Security – PGP-S/MIME.	**9**
	Total	**45**

TEXT BOOKS

1.	Behrouz A. Foruzan, "*Data communication and Networking*", Tata McGraw-Hill, Fifth edition, 2013.
2.	James F. Kurouse & W.Rouse, "*Computer Networking: A Topdown Approach Featuring*", Pearson Education, Third edition.

REFERENCE BOOKS

1.	Andrew S. Tannenbaum, "*Computer Networks*", PHI, Fourth Edition, 2003.
2.	William Stallings, "*Data and Computer Communication*", Sixth Edition, Pearson Education, 2000.
3.	Larry L.Peterson & Peter S. Davie, "*Computer Networks*", Harcourt Asia Pvt. Ltd., Second Edition.

U15EC905	DIGITAL IMAGE PROCESSING	L T P C 3 0 0 3

COURSE OUTCOMES

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

1. Introduce the fundamentals of image processing.
2. Describe various transforms used in image processing.
3. Elaborate various techniques of image enhancement and reconstruction.
4. Appreciate the various aspects of image segmentation and image representation.
5. Provide an overview of image Compression Techniques and Compression Standards.

UNIT I	**DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS** Fundamental Steps in Digital Image Processing – Elements of Visual Perception – Some Basic Relationship Between Pixels – Connectivity – Distance Measure – Brightness – Contrast – Hue-Saturation – Mach Band Effect – Image Sampling – Quantization – Dither – Colour Image Fundamentals RGB – HSI Models – Conversion from RGB to HSI.	**9**
UNIT II	**IMAGES TRANSFORMS** 1D DFT – 2D Transforms – DFT – DCT – DST – Walsh – Hadamard – Haar Transform – Discrete Wavelet Transform – Multi Resolution Analysis – SVD	**9**
UNIT III	**IMAGE ENHANCEMENT** Spatial Domain Approach – Point Processing – Image Negative – Contrast Stretching – Gray Level Slicing – Histogram Equalization – Image Addition – Subtraction – Averaging – Smoothing Filters – Spatial LPF – Median Filter – Sharpening Filters – Spatial HPF – High Boost Filter – Derivative Filters Frequency Domain Filters – Homomorphic Filter.	**9**
UNIT IV	**IMAGE RESTORATION AND SEGMENTATION** Degradation Model – Noise Models – Types of Restoration – Inverse Filtering – Least Mean Square (wiener–parametric wiener) Filter – Image Segmentation – Point – Line and Edge Detection – Region Based Segmentation – Region Splitting and Merging – Thresholding.	**9**
UNIT V	**IMAGE COMPRESSION** Image Compression – Lossless Compression – Huffman Coding – Minimum Variance Huffman Coding – Arithmetic Coding – LZW Coding – Lossy Compression – Transform Coding – Compression Standards – JPEG Image Compression Standards – MPEG Video Compression Standards-Block Diagram Approach.	**9**
	Total	**45**

TEXT BOOKS

1.	Rafael C- Gonzalez- Richard E-Woods, "*Digital Image Processing*", Pearson Education, Eleventh Impression, 2013.
2.	Jayaraman S., Esakkirajan and Verrakumar, "*Digital Image Processing*", TMH New Delhi, 2009.

REFERENCE BOOKS

1.	Annadurai S., R. Shanmugalakshmi, "*Fundamentals of Digital Image Processing*", Pearson Education India, 2007.
2.	Anil K- Jain, "*Fundamentals of Digital Image Processing*", Pearson/Prentice Hall of India, 2002.
3.	Sridhar.S, "*Digital Image Processing*", Oxford University Press, First Edition, 2011.
4.	Sabeenian R.S., "*Digital Image Processing*", Sonaversity publication, Second Edition, 2010.
5.	Kenneth R. Castleman, "*Digital Image Processing*", Pearson, 2009.

U15EC906	CMOS VLSI DESIGN	L T P C 3 0 0 3

COURSE OUTCOMES

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

1. Introduce the fundamental issues of VLSI technology and to understand the CMOS inverter characteristics
2. Understand fabrication methods of CMOS technology and to appreciate the limitations imposed by the processing technology on the VLSI circuit designer
3. Estimate the basic circuit parameters of CMOS circuits.
4. Understand the principles of design verification and testing
5. Describe the systems design strategies and their implementation via automated techniques and high level design languages.

UNIT I	**MOS TRANSISTOR THEORY** Introduction – Basic MOS Structure – MOS Switches – nMOS and pMOS Transistor Operation and VI Characteristics – Threshold Voltage – MOS Device DC Equations – MOS models – Small Signal AC Characteristics – Second Order Effects – Complementary CMOS Inverter DC Characteristics – Transmission Gates – Tristate Inverters.	**9**
UNIT II	**CMOS PROCESSING TECHNOLOGY** Silicon Semiconductor Technology – nMOS Fabrication – pMOS Fabrication – Basic CMOS Technology – CMOS Process Enhancement – BiCMOS Technology – Layout Design Rules – MOS Layers – Stick Diagram – Latch up.	**9**
UNIT III	**CMOS CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION** Resistance Estimation – Capacitance Estimation – Switching Characteristics – CMOS Gate Transistor Sizing – Power Dissipation – Charge Sharing – Design Margining – Yield – Reliability – SPICE Modelling of MOS Capacitances.	**9**
UNIT IV	**CMOS TESTING** Need for Testing – Testers – Text Fixtures and Test Programs – Logic Verification Silicon Debug Principles – Manufacturing Test – Design for Testability – Boundary Scan.	**9**
UNIT V	**VHDL** Introduction to VHDL – Tutorial – Entity Declaration – Architecture Body – Configuration Declaration – Package Declaration – Package Body – Identifiers – Operators – Behavioral modelling – Process Statement – Wait Statement – If Statement – Loop Statement – Data Flow Modelling – Structural Modelling – Component Declaration – Component Instantiation.	**9**
	Total	**45**

TEXT BOOKS

1. Neil Weste and David Money Harris,"*CMOS VLSI Design*", Addison Wesley, March 2010.
2. J. Bhasker, "*VHDL Primer*", Pearson Education, 2006

REFERENCE BOOKS

1. Albert Raj A and Latha T, "*VLSI Design*", Prentice Hall of India, New Delhi, 2008
2. Wayne Wolf, "*Modern VLSI Design*", Pearson Education, 2003
3. Smith M.J. S. "*Application Specific Integrated Circuits*", Pearson Education, 1997
4. Pucknell D.A and Eshraghian K., "*Basic VLSI Design*", Third Edition, PHI, 2003

U15EC603	COMMUNICATION LABORATORY	L T P C 0 0 4 2

COURSE OUTCOMES

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

1. Construct the sample and hold circuit and recover the original signal from the sampled version.
2. Design and construct AM and FM signal generator and demodulator.
3. Construct an experiment to generate and detect the signal using analog pulse modulation.
4. Plot the radiation pattern of dipole, square loop antenna in azimuthal and elevation plane.
5. Generate and demodulate various types of digital modulation techniques.

Exp. No.	List of Experiments :
	Analog communication
1	Amplitude modulation and demodulation.
2	Frequency modulation and demodulation.
3	Characteristics of AM receiver (Selectivity and Sensitivity).
	Digital communication
4	Sampling and time division multiplexing.
5	Pulse modulation techniques - PAM, PWM, PPM.
6	Pulse code modulation.
7	Study of line coding formats and decoding.
8	Delta modulation and demodulation.
9	Differential pulse code modulation.
10	Digital modulation -ASK, FSK, PSK, QPSK.
	RF communication
11	Radiation pattern of half wave dipole antenna.
12	Radiation pattern of Yagi uda antenna.
13	Radiation pattern of loop antenna.
14	Analysis of Filters using Network analyzer.

U15CS605	C++ LABORATORY	L T P C 0 0 4 2

COURSE OUTCOMES

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

1. Design and develop simple programs using basic concepts of C++
2. Develop programs using the concept of classes, static members and constructors
3. Develop programs using Polymorphism and inheritance.
4. Design and develop simple programs using linear data structures.
5. Design and develop programs for breadth first and depth first traversals.

Exp. No.	List of Experiments:
1.	Functions with call by value, call by reference, default arguments and function overloading.
2.	Design of classes with static and non static members, friend functions and creating array of objects.
3.	Implementation of inheritance and polymorphism.
4.	Array implementation of list ADT.
5.	Linked list implementation of list ADT.
6.	Implementation of stack ADT using linked list.
7.	Conversion of infix to postfix expression.
8.	Implementation of queue ADT using array.
9.	Implementation linear search & binary search.
10.	Implementation of sorting algorithms.
11.	Implementation of breadth first and depth first traversals.

U15GE601C	U15GE601C :Quantitative Aptitude and Reasoning	L T P C Marks 1 4 0 3 100

COURSE OUTCOMES

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

1. Acquire the knowledge required to develop solutions or strategies to solve the arithmetical, algebraic, geometrical and statistical problems
2. Demonstrate an in-depth understanding on the ideas related to time, speed, distance and work
3. Collect and organise appropriate formulae and use them solve modern-day mathematics
4. Apply the skills needed when making decisions based on the condition given in the problems
5. Analyse the given data logically and come to definite conclusions

UNIT I	**Quantitative Aptitude I** Number System – H.C.F and L.C.M – Averages – Percentages – Ratio and Proportion – Partnership – Problems on Ages – Allegation and Mixture	**15**
UNIT II	**Quantitative Aptitude II** Profit and Loss – Time and Distance – Problems on Trains – Boats and Streams – Time and Work – Pipes and Cisterns – Clocks - Calendars	**15**
UNIT III	**Quantitative Aptitude III** Permutation and Combination - Probability – Simple Interest – Compound Interest - Area and Perimeter – Volume and Surface area – Heights and Distances – Data Interpretation	**15**
UNIT IV	**Logical Reasoning I** Blood Relations – Coding and Decoding – Direction Sense – Data Sufficiency – Statement and Conclusions – Statement and Assumptions	**15**
UNIT V	**Logical Reasoning II** Syllogism – Seating Arrangement – Symbols and Series – Cubes and Dices – Arithmetic Reasoning – Puzzles	**15**
		Total: 75

TEXT BOOKS

1. Dr.R.S.Aggarwal, Quantitative Aptitude for Competitive Examinations (English) 8th Edition. S Chand Publishing 2015
2. Dr.R.S.Aggarwal, A Modern Approach To Verbal & Non Verbal Reasoning (English) Revised Edition, S Chand Publishing 2012.

REFERENCE BOOKS

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations (English) 5th Edition, Tata McGraw Hill 2014
2. Nishit K Sinha, The Pearson Guide to Logical Reasoning and Data Interpretation for the CAT and other MBA Entrance Examinations 4th Edition, Pearson 2013.

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

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit
Theory							
1	U15CS601	Principles of Compiler Design		3	0	0	3
2	U15CS602	Software Engineering		3	0	0	3
3	U15GE602A	Principles of Management		3	0	0	3
4	U15CS915	**Elective**	Business Intelligence	3	0	0	3
	U15CS916		Mobile Device System Development				
	U15CS917		Cryptography and Network Security				
5	U15CS919	**Elective**	Software Project Management	3	0	0	3
	U15CS921		Human Computer Interaction				
	U15CS924		Graph Theory and Combinatorics				
6	U15FT1001	**Open Elective**	Fundamental of Fashion Design	3	0	0	3
	U15EC1001		Cellular and Mobile Communication				
	U15EC1002		Embedded Systems				
	U15EC1003		Satellite Communication				
	U15CE1001		Building Services and Safety Regulation				
	U15CE1002		Energy Efficiency and Green Building				
	U15CE1003		Natural Disaster Mitigation and Management				
	U15ME1002		Industry Robotics				
	U15ME1003		Industrial Safety				
	U15ME1005		Renewable Energy Sources				
Practical							
7	U15CS603	Compiler Design Laboratory		0	0	4	2
8	U15CS604	Creative and Innovative Project		0	0	4	2
9	U15GE601B	Soft Skills and Aptitude – IV		0	0	2	1
						Total Credits	**23**

Approved By

Chairperson, Computer Science and Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.M.Usha	Dr.R.Shivakumar	Dr.M.Usha

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

U15CS601 PRINCIPLES OF COMPILER DESIGN 3 0 0 3

COURSE OUTCOMES:

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

- Describe the principles of compilation.
- Design and implement a lexical analyzer.
- Design and analyze various top down and bottom up parsers.
- Generate the Intermediate Languages for code generation.
- Design and analyze code generation schemes and optimized compilers.

UNIT I INTRODUCTION TO COMPILERS 5

Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Language basics.

UNIT II LEXICAL ANALYSIS 9

Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

UNIT III SYNTAX ANALYSIS 10

Need and Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser -LR (0)Item Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language .

UNIT IV SYNTAX DIRECTED TRANSLATION & RUN TIME ENVIRONMENT 12

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions-Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions. RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation Parameter Passing-Symbol Tables-Dynamic Storage Allocation.

UNIT V CODE OPTIMIZATION AND CODE GENERATION 9

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis-Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

Total : 45 hours

TEXTBOOK:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, “Compilers – Principles, Techniques and Tools”, 2 nd Edition, Pearson Education, 2014.

REFERENCES:

1. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, “Advanced Compiler Design and Implementation, “Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004. 4. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.

U15CS602 SOFTWARE ENGINEERING 3 0 0 3

COURSE OUTCOME:

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

- Compare and analyze the various lifecycle models of software process
- Describe the process of requirement engineering
- Design the methods for software architecture
- Implement the strategies for software testing
- Explore the significance of project planning and management

UNIT -I SOFTWARE PROCESS 9

Introduction –Software Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented and Agile software project management model) - system engineering – computer based system – verification – validation.

UNIT -II SOFTWARE REQUIREMENTS 9

Functional and non-functional - user – system –requirement engineering process – feasibility studies – requirements – elicitation – validation and management – software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping -Software document. Analysis and modeling – data, functional and behavioral models – structured analysis and data dictionary.

UNIT -III DESIGN CONCEPTS AND PRINCIPLES 9

Design process and concepts – modular design – design heuristic – design model and document. Architectural design – software architecture – data design – architectural design– user interface design – user interface design principles. Real time systems - Real time software design. SCM – Need for SCM – Version control – Introduction to SCM process – Software configuration items - software design with extreme programming – Risk Management.

UNIT -IV TESTING 9

Taxonomy of software testing – levels – test activities – types of software test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms – regression testing – testing in the large - software testing strategies - testing using extreme programming.

UNIT -V SOFTWARE PROJECT MANAGEMENT 9

Measures and measurements – S/W complexity and science measure – size measure – data and logic structure measure – information flow measure. Software cost estimation – function point models – COCOMO model- Delphi method.- Defining a Task Network – Scheduling – Earned Value Analysis – Error Tracking - Software changes – program evolution dynamics – software maintenance – Architectural evolution.

Total : 45 hours

TEXT BOOK

1. Roger S.Pressman, Software engineering- A practitioner’s Approach, McGraw-Hill International Edition, 8th edition,2015.

REFERENCES

1. Ian Sommerville, Software engineering, Pearson education Asia, 9th edition, 2011.
2. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
3. James F Peters and Witold Pedryez, “Software Engineering – An Engineering Approach”, John Wiley and Sons, New Delhi, 2000.
4. Ali Behforooz and Frederick J Hudson, “Software Engineering Fundamentals”, Oxford University Press, New Delhi, 1996

U15GE602A PRINCIPLES OF MANAGEMENT 3 0 0 3

COURSE OUTCOME:

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

- Identify the organizational factors and roles of Management
- Describe the nature and purpose of planning, forecasting and decision making
- Expose the knowledge on concepts of organizing
- Analyze the concepts of delegation of authority and Organization culture.
- Introduce the HRD concepts and planning operations

UNIT-I INTRODUCTION 9

Definitions of Management-Scope of Management-Levels of Management-Functions and Roles of a manager-Evolution of Management thought-Organisation and Environmental Factors-Forms of Business Organizations-Corporate Social Responsibility-recent trends and challenges in global management scenario.

UNIT-II PLANNING 9

Definition of Planning-Nature and purpose of planning-Planning process-Types of plans-Objectives-Management of objective(MBO)-Management by exception-Types of strategies-Decision Making: definition and process-Types of managerial decision-group decision making techniques-Decision making under different conditions-forecasting and its techniques.

UNIT-III ORGANISING 9

Definition of organizing-Nature and purpose of organizing-Formal and informal organizations-organization charts-Organization structures-Span of control-factors determining effective span-line and staff authority-Departmentation-Centralization and Decentralization-Delegation of authority-staffing-selection and recruitment-Orientation-Training and development-Performance Appraisal-organization change-Staffing

UNIT-IV DIRECTING 9

Directing: nature and purpose-Motivation and Satisfaction-Motivation theories-job enrichment-definition of leadership-elements of leadership-Leadership styles-leadership theories-Communication-process and barriers to effective communication-Organization culture-Elements and types of culture-Managing cultural diversity.

UNIT-V CONTROLLING 9

Process of controlling-Types of control-Budgetary and non-budgetary control techniques- MIS-Managing productivity-const control-purchase control- Maintenance control-quality control-planning operations-performance standards-Measurement of performance-Remedial actions.

Total : 45 hours

TEXT BOOKS:

1. Stephen P. Robbins & Mary Coulter, " Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management” Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, “ Management”, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich “Essentials of management” Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata Mcgraw Hill, 1999

U15CS915 BUSINESS INTELLIGENCE 3 0 0 3

COURSE OUTCOMES

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

- Demonstrate the processes associated with Business Intelligence framework
- Solve a business scenario, by identifying the metrics, indicators and make recommendations to achieve the business goal
- Develop analytical and critical thinking skills for the development of integrative plans for enterprise-wide systems that optimize enterprise performance.
- Design an enterprise dashboard that depicts the key performance indicators which helps in decision making
- Apply business intelligence concepts in cloud computing, ERP systems etc.,

UNIT-I INTRODUCTION TO BUSINESS INTELLIGENCE 9

Introduction to digital data: Introduction**,** Types – structured, semi-structured and unstructured

Introduction to OLTP and OLAP: OLTP Vs OLAP, Architectures (MOLAP, ROLAP, HOLAP), OLAP Operations

BI Definitions & Concepts: BI Framework, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices

UNIT-II BASICS OF DATA INTEGRATION 9

Data Integration: Concepts, needs and advantages of using data integration, introduction to common data integration approaches, Meta data - types and sources, Introduction to data quality, data profiling concepts and applications.

Kettle Software: Introduction to ETL using Pentaho data Integration

UNIT-III INTRODUCTION TO MULTI-DIMENSIONAL DATA MODELING 9

Multidimensional data model : Introduction to data and dimension modeling, data modeling basics, Types, Techniques, fact and dimension tables, Dimensional models

Measures and Metrics: Introduction to business metrics and KPIs, KPI usage in companies

Creating cubes using Microsoft Excel

UNIT-IV BASICS OF ENTERPRISE REPORTING 9

Reporting: A typical enterprise, Malcolm Baldrige - quality performance framework, Balanced scorecard, Enterprise dashboard, Balanced scorecard vs. enterprise dashboard, Best practices in the design of enterprise dashboards

Enterprise reporting using MS Access / MS Excel

UNIT –V BI APPLICATIONS AND CASE STUDIES 9

Applications: Understanding BI and mobility, BI and cloud computing, BI for ERP systems, Social CRM and BI

Case Study Briefs: Good Lift HealthCare group, Ten to Ten retail store

Total : 45 hours

TEXT BOOKS

1. RN Prasad and Seema Acharya, “Fundamental of Business Analytics”, Wiley India Pvt. Ltd, 2011.

REFERENCES

1. John Boyer, Bill Frank, Brian Green, Tracy Harris, and Kay Van De Vanter “Business Intelligence Strategy: A Practical Guide for Achieving BI Excellence”, IBM Corporation, 2010.
2. R. Sharda, D. Delen, & E. Turban .Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. ; Pearson/Prentice Hall, 2015.
3. Swain Scheps “Business Intelligence for Dummies”, Wiley Publishing Inc, 2008.
4. Cindi Howson “ Successful Business Intelligence:Secrets to making BI a killer App”, McGraw Hill, 2008.
5. Elizabeth Vitt, Michael Luckevich, Stacia Misner “Business Intelligence: Making Better Decisions Faster”, Microsoft Press, 2002.

U15CS916 MOBILE DEVICE SOFTWARE DEVELOPMENT 3 0 0 3

COURSE OUTCOMES:

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

- Explain development framework and the need for mobile applications.
- Create applications with layouts, framework, intents and broadcast receivers.
- Develop applications with database connectivity.
- Develop applications to improvise user experience.
- Design a complete iOS application in xcode by using swift.

UNIT - I INTRODUCTION 9

Android: An Open Platform for Mobile Development– Android SDK Features-Introducing the development framework - Standard development environment for Android applications – Creating Your First Android Application – Types of Android Application- Android Development Tools.

UNIT - II CREATING APPLICATIONS AND ACTIVITIES 9

Introducing the Application Manifest File- Using the Manifest Editor- Externalizing Resources- Android Application Lifecycle – Introducing the Android Application Class – Android Activities - Fundamental Android UI Design- Android User Interface Fundamentals- Introducing Layouts- Introducing Fragments, Creating New Views- Introducing Adapters - Introducing Intents- Creating Intent Filters and Broadcast Receivers

UNIT - III WORKING WITH FILES AND DATABASES 9

Shared Preferences – Working with the file systems - Introducing Android Databases- Introducing SQLite- Content Values and Cursors- Working with SQLite Databases

UNIT - IV EXPANDING THE USER EXPERIENCE 9

Working in the background - Creating and Using Menus and Action Bar Action Items - Monetizing, Promoting, and Distributing Applications

UNIT - V IOS APPLICATION DEVELOPMENT 9

Introduction and xcode – Autolayout and Buttons – View Controller and Multiple Views – Delegation and Recording – Playback and Audio effects

Total : 45 hours

TEXT BOOK

1. Reto Meier, "Professional Android Application Development", Wiley, 2012
2. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

REFERENCE

1. http://developer.android.com/develop/index.html
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
3. https://developer.apple.com/library/content/referencelibrary/GettingStarted/DeveloperiOSAppsSwift/

U15CS917 CRYPTOGRAPHY AND NETWORK SECURITY 3 0 0 3

COURSE OUTCOMES:

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

- Compare the various conventional encryption algorithms
- Apply number theory in public key encryption schemes to encrypt messages
- Analyze the various authentication algorithms and Hash functions.
- Analyze the various the network security tools and applications
- Analyze the various techniques to protect the system from security threats and viruses

UNIT - I INTRODUCTION 9

OSI Security Architecture - Classical Encryption techniques - Cipher Principles - Data Encryption Standard - Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES - AES Cipher - Triple DES - Placement of Encryption Function - Traffic Confidentiality

UNIT – II PUBLIC KEY CRYPTOGRAPHY 9

Introduction to Number Theory - Confidentiality using Symmetric Encryption - Public Key Cryptography and RSA - Key Management - Diffie-Hellman key Exchange - Elliptic Curve Architecture and Cryptography

UNIT – III AUTHENTICATION AND HASH FUNCTION 9

Authentication requirements - Authentication functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - RIPEMD - HMAC Digital Signatures - Authentication Protocols - Digital Signature Standard

UNIT – IV NETWORK SECURITY 9

Authentication Applications: Kerberos - X.509 Authentication Service - Electronic Mail Security - PGP - S/MIME - IP Security - Web Security.

UNIT - V SYSTEM LEVEL SECURITY 9

Intrusion detection - password management - Viruses and related Threats - Virus Counter measures - Firewall Design Principles - Trusted Systems.

Total : 45 hours

TEXT BOOKS

1. S. Bose, P. Vijayakumar, “Cryptography and Network Security”, Pearson India, 1st Edition, 2017.

REFERENCES

1. William Stallings, "Cryptography And Network Security - Principles and Practices", Pearson, Edition, 2014.
2. Wenbo Mao, “Modern cryptography: Theory and Practice”, HP / PHI, 2003
3. Atul Kahate, "Cryptography and Network Security", third edition, Tata McGraw-Hill, 2013.
4. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2015
5. Charles B. Pfleeger, Shari Lawrence Pfleeger, "AnalyzingCompuer security", Third Edition, Pearson Education, 2012..

U15CS919 SOFTWARE PROJECT MANAGEMENT 3 0 0 3

COURSE OUTCOMES:

After successful completion the course, the student will be able to

- Explore the roles of the project manager and opportunities in project management
- Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities
- Apply best practices to develop competencies and skills in planning and controlling projects to ensure successful outcomes
- Analyze the scheduling resources using various models
- Identify suitable project management techniques for the managers.

UNIT-I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9

Project Definition – Contract Management – Activities Covered by Software Project Management – Overview of Project Planning – Stepwise Project Planning.

UNIT-II PROJECT EVALUATION 9

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation – Software effort Estimation

UNIT-III ACTIVITY PLANNING 9

Objectives – Project Schedule – Sequencing and Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning and Control.

UNIT-IV MONITORING AND CONTROL 9

Resource allocation - identifying and scheduling resources – publishing resource and cost schedule – scheduling sequence - Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Priortizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT-V MANAGING PEOPLE AND ORGANIZING TEAMS 9

Introduction – Understanding Behavior – Organizational Behavior - Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures – Stress – Health And Safety – Case Studies.

Total: 45 hours

TEXT BOOK

1. Bob Hughes, Mikecotterell, “Software Project Management”, Fifth Edition,Tata McGraw Hill, 2010.

REFERENCES

1. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2006.
2. Royce, “Software Project Management”, Pearson Education, 2005.
3. Jalote, “Software Project Management in Practice”, Pearson Education, 2002.
4. Robert T. Futrell, Donald F. Shefer and Linda I. Shefer, “Quality Software Project Management”, Pearson Education, 2006

U15CS921 HUMAN COMPUTER INTERACTION 3 0 0 3

COURSE OUTCOMES:

After successful completion the course, the student will be able to

- Design effective dialog for HCI.
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the Usability specification.
- Develop meaningful standard user interface

UNIT–I FOUNDATIONS OF HCI 9

Human- Introduction- Input and output channels- Human Memory- Problem solving and reasoning - Emotion- Individual Differences- Psychology and design of interactive system; Computer- Introduction- Text entry device- Positioning, pointing and drawing- Display device- Physical controls, Sensor, Special devices.

UNIT-II INTERACTION AND DESIGN BASICS 9

Models of interaction- Framework and HCI- Ergonomics- Interaction styles- Elements of WIMP interface- Interactivity; Interaction Design Basics: The process design, User focus, Scenarios, Navigation design, Screen design and layout, Iteration and prototyping

UNIT-III SOFTWARE PROCESS 9

Introduction- The software life cycle- activity- validation and verification- Management and contractual issues- Usability engineering- Iterative design and prototyping- Techniques for prototyping. Design Rules: Introduction- Principles to support Usability - Standards – Guidelines -Golden rules.

UNIT-IV IMPLEMENTATION SUPPORT EVALUATION TECHNIQUES 9

Elements of Windowing system – Using toolkits – Programming the application - User interface management ; Evaluation techniques – Goals of Evaluation – Evaluation through expert analysis – Evaluation through User Participation - choosing an evaluation method - Universal design principles- Multimodal interaction

UNIT –V MODELS AND THEORIES 9

Cognitive models: Goal & task hierarchies – Linguistic models – Physical and device models – Cognitive architectures; Communication and collaboration Models: Face-to-Face communication – Conversation – Text based communication – Group working

Total: 45 hours

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004

REFERENCES:

1. Linda Mcaulay, “HCI for Software Designers”, International Thompson Computer Press, USA,1995.
2. Ben Schneiderman, "Designing the User Interface", Pearson Education, fifth edition, New Delhi, 2013.
3. Alan Cooper, "The Essentials of User Interface Design", IDG Books, New Delhi, 2002.
4. Jacob Nielsen, "Usability Engineering", Academic Press, 1994.

U15CS924 GRAPH THEORY AND COMBINATORICS 3 0 0 3

COURSE OUTCOMES:

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

- Apply fundamental concepts of Graph Theory
- Formulate and solve problems related to trees, connectivity and Planar Graphs
- Prove and apply the theorems on Graph coloring , matching and directed graphs
- Apply and solve applications involving Permutations and Combinations
- Generate functions for various kinds of problems

UNIT - I INTRODUCTION 9

Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits –Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees.

UNIT - II TREES, CONNECTIVITY & PLANARITY 9

Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometric graphs – Planer graphs – Different representation of a planer graph.

UNIT - III MATRICES, COLOURING AND DIRECTED GRAPH 9

Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.

UNIT - IV PERMUTATIONS & COMBINATIONS 9

Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions

UNIT - V GENERATING FUNCTIONS 9

Generating functions - Partitions of integers - Exponential generating function – Summation operator - Recurrence relations - First order and second order – Non-homogeneous recurrence relations - Method of generating functions.

Total: 45 hours

TEXT BOOKS:

1. Narsingh Deo, “Graph Theory: With Application to Engineering and Computer Science”, Prentice Hall of India, 2003.
2. Grimaldi R.P. “Discrete and Combinatorial Mathematics: An Applied Introduction”, Addison Wesley, 1994.

REFERENCES:

1. Clark J. and Holton D.A, “A First Look at Graph Theory”, Allied Publishers, 1995.
2. Mott J.L., Kandel A. and Baker T.P. “Discrete Mathematics for Computer Scientists and Mathematicians” , Prentice Hall of India, 1996.
3. Liu C.L., “Elements of Discrete Mathematics”, Mc Graw Hill, 1985.
4. Rosen K.H., “Discrete Mathematics and Its Applications”, Mc Graw Hill, 2007

U15CS603 COMPILER DESIGN LABORATORY 0 0 4 2

COURSE OUTCOMES:

After successful completion of the course, the students would be able to

- Construct minimized DFA from a given regular expression using C program.
- Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and *
- Use YACC and LEX to implement a parser for the grammar.
- Write a program to implement shift reduced parsing algorithms.
- Generation a code for a given intermediate code .
- Apply new code optimization techniques to improve the performance of a program in terms of speed & space.

LIST OF EXPERIMENTS:

1. Construction of NFA.
2. Construction of minimized DFA from a given regular expression.
3. Use LEX tool to implement a lexical analyzer.
4. Use YACC and LEX to implement a parser for the grammar.
5. Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and *.
6. Construction of operator precedence parse table.
7. Implementation of symbol table
8. Implementation of shift reduced parsing algorithms.
9. Construction of LR parsing table.
10. Generation of code for a given intermediate code.
11. Implementation of code optimization techniques.

Total: 45 hours

U15CS604 CREATIVE AND INNOVATIVE PROJECT 0 0 4 2

COURSE OUTCOMES:
Upon completion of this course, the students will be able to

- Convert user requirements to a software architecture diagram
- Identify and specify the pre-processing necessary to solve a problem
- Suggest optimum solutions by comparing the different solutions from an algorithmic perspective
- Discover the research implications in any societal problem
- Design and use performance metrics to evaluate a designed system

INTERNALS

a. First Review

I. Block Diagram of the proposed solution for a societal / creative problem
II. New Contribution in terms of modifications to existing algorithm or suggestion of new ones
III. Detailed Design of each module
IV. Evaluation Metrics
V. Test Cases

b. **Second Review**

I. Implementation - Justifying pros and Cons
II. Coding - highlighting what has been reused and what is being written

c. Third Review

I. Test Runs ii. Performance Evaluation based on Metrics iii. Project Documentation

EXTERNALS

- Presentation, Viva-Voce, Report submission

Semester –VI	U15GE601B :SOFT SKILLS AND APTITUDE -IV	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 job-oriented company selection processes using the hands-on approach

2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests

3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in placement specific internal tests

1. Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. Mock group discussions b. Mock interviews c. Mock stress interviews
2. Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Progressions b. Heights and Distances c. Simple Interest d. Compound Interest e. Calendars f. Area and Perimeter g. Volume and Surface Area h. Boats and Streams i. Data Interpretation j. Puzzles k. Artificial Language l. Mathematical Operators m. Statement and Conclusion n. Data Sufficiency o. Geometry p. Company specific aptitude questions
3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Story a story for given pictures g. Company specific aptitude questions

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15IT601	Data Mining	3	0	0	3
2	U15IT602	Principles of Compiler Design	3	0	0	3
3	U15IT901	**Elective –** Numerical Methods	3	0	0	3
4	U15IT934	Theory of Computation				
	U15IT936	Machine Learning				
	U15IT904	**Elective –** Distributed Systems	3	0	0	3
	U15IT905	Advanced Java Programming				
	U15IT923	Multimedia Systems				
5	U15FT1001	**Open Elective –**Fundamentals of Fashion Design	3	0	0	3
	U15FT1002	Ornamentation techniques for Value addition of Apparel				
	U15EC1003	Satellite Communication				
	U15EC1002	Embedded Systems				
	U15CE1002	Energy Efficiency and Green Building				
	U15CE1003	Natural Disaster Mitigation and Management				
	U15ME1005	Renewable Energy Sources				
	U15EE1002	Energy Conservation and Management				
Practical						
6	U15IT603	Python Programming Laboratory	1	0	4	3
7	U15IT604	Software Design and Testing Laboratory	0	0	4	2
8	U15IT605	Internet of Things Laboratory	1	0	2	2
9	U15IT606	Mini Project - II	0	0	2	1
10	U15GE601B	Soft Skills and Aptitude - IV	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, Sixth Semester BE IT Students and Staff, COE

U15IT601 DATA MINING 3 0 0 3

COURSE OUTCOMES

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

1. Apply the concepts of building a data warehouse and explore the various methods for implementing data warehouse
2. Explain the fundamental processes, concepts and techniques of data mining
3. Explain the concepts of association rule mining and classification and apply appropriate algorithm for the given data
4. Apply clustering algorithms to data sets
5. Investigate the different applications and trends of data mining.

UNIT I DATA WAREHOUSING 9

Data warehouse Overview: What is a data warehouse, A Multidimensional Model, Architecture, implementation, from data warehouse to data mining.

Data cube technology: OLAP technology, attribute oriented induction.

UNIT II INTRODUCTION TO DATA MINING 9

Introduction – Data – Types of Data – Data Mining Functionalities – Kinds of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues.

Data Preprocessing: Need to preprocess, data cleaning, data integration, data reduction, data transformation and discretization, concept hierarchy generation.

UNIT III ASSOCIATION RULE MINING AND CLASSIFICATION 10

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification - Lazy Learners – Prediction.

UNIT IV CLUSTERING 9

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods– Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods.

UNIT V APPLICATIONS AND TRENDS IN DATA MINING 8

Mining complex data types, other methodologies, Data Mining Applications, Social Impacts of data mining, Trends in data mining,

Total: 45 hours

TEXT BOOK

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Morgan Kaufmann, 2016.

REFERENCES

1. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata Mc Graw Hill Edition, Tenth Reprint 2007.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction To Data Mining”, Pearson Education, 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay “, Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Soumendra Mohanty, “Data Warehousing Design, Development and Best Practices”, Tata McGraw Hill Edition, 2006.

U15IT602 PRINCIPLES OF COMPILER DESIGN 3 0 0 3

COURSE OUTCOMES

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

1. Describe the phases of compilation process, purpose and implementation approach of each phase
2. Build NFA and DFA using the formalisms and techniques including regular expressions, and LEX tool
3. Explain the concepts of context free grammar, different parsing techniques and YACC tool
4. Apply semantic analysis of expressions and design code generation schemes
5. Implement various parsing, conversion, optimization and code generation algorithms for the design of a compiler

UNIT I INTRODUCTION TO COMPILERS 9

Introduction: Compilers, Analysis of the Source Program, The Phases of a Compiler, Cousins of the Compiler, The Grouping of Phases, Compiler-Construction Tools

UNIT II LEXICAL ANALYSIS 9

Lexical Analysis: Need and role of lexical analyzer, Lexical errors, Input Buffering, Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Finite Automata, From a Regular Expression to an NFA

LEX: Design of a Lexical Analyzer Generator.

UNIT III SYNTAX ANALYSIS 9

Syntax Analysis: Need and role of the parser, Context Free Grammars

Top Down parsing: Introduction, Recursive Descent Parser, Predictive Parser, LL (1) Parser

Bottom-Up Parsing: Introduction, Shift Reduce Parser, LR Parser, LR (0) item, Construction of SLR Parsing table, Canonical LR Parsing, LALR Parser

YACC: Design of a syntax analyzer for a sample language.

UNIT IV SYNTAX DIRECTED TRANSLATION 9

Syntax directed translation: Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, Bottom-Up Evaluation of Inherited Attributes

Intermediate Code Generation: Forms of intermediate code, Translation of Assignment, Boolean Expression and Control statements, Back -Patching type systems

UNIT V CODE OPTIMIZATION AND CODE GENERATION 9

Code Optimization: Principal sources of Optimization, Directed Acyclic Graph, Optimization of basic blocks, Global data flow analysis, Efficient data flow algorithms

Code Generation: Issues in design of a code generator, simple code generator algorithm

TOTAL: 45 hours

TEXT BOOK

1. Alfred V.Aho, Ravi Sethi and Jeffrey D.Ullman, "Compilers – Principles, Techniques and Tools", second edition, Pearson Education, New Delhi, 2006.

REFERENCES

1. Dhamdhere D M, "Compiler Construction Principles and Practice", second edition, Macmillan India Ltd., New Delhi, 2002.
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", McGraw Hill, New Delhi, 2001.
3. Dick Grone, Henri E Bal, Ceriel J H Jacobs and Koen G Langendoen, “Modern Compiler Design”, John Wiley, New Delhi, 2000.
4. Raghavan V, “Principles of Compiler Design”, Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2009.

U15IT603 PYTHON PROGRAMMING LABORATORY 1 0 4 3

COURSE OUTCOMES

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

1. Develop python applications for real world problems.
2. Create applications using files and modules.
3. Develop applications using Django framework.

UNIT I INTRODUCTION TO PYTHON 5

Introduction: Features - Installing - Running, Syntax and Style: Variable Assignment - Memory Management, Python Objects: Standard Types, Numbers, Sequences: Strings - Lists - Tuples, Dictionaries

UNIT II PYTHON FILES AND MODULE 4

Conditions and Loops. Files and Input/Output: File Objects and Built in functions - Functions

UNIT III INTRODUCTION TO DJANGO 6

Overview - Django Basics - Templates and static media - Models and Databases.

Total: 15 hours

REFERENCES

1. Wesley J. Chun, "Core Python Programming", Pearson, 2nd Edition, 2006.
2. Mark Lutz, "Learning Python", O'Reilly Media, 4th Edition, 2003.
3. Allen Downey, "Think Python: How to Think Like a Computer Scientist", Green tea Press, 2nd Edition.
4. Leif Azzopardi and David Maxwell, " Tango With Django: A beginner's Guide to Web Development With Python / Django" , 2nd Edition, 2016.

LIST OF EXPERIMENTS

1. Develop programs to understand the control structures of python
2. Develop programs to learn different types of structures (list, dictionary, tuples) in python
3. Develop programs to learn concept of functions scoping, recursion and list mutability.
4. Develop programs for data structure algorithms using python – searching, sorting and hash tables.
5. Develop programs using Python Module
6. Develop programs to read and Write a text file
7. Learn to plot different types of graphs using PyPlot.
8. Develop programs using Django templates and media
9. Develop programs using Django Models
10. Develop programs using Django Database

U15IT604 SOFTWARE DESIGN AND TESTING LABORATORY 0 0 4 2

COURSE OUTCOMES

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

1. Analyse the problem, gather requirements, design the system using UML diagrams and implement the system using object oriented programming
2. Test the system using automated tools and Junit
3. Reverse engineer source code back to UML models

EXPERIMENTS

Prepare the following documents for the projects listed below and develop the application using software engineering methodology.

1. Program Analysis and Project Planning - Thorough study of the problem – Identify project scope, Objectives, Infrastructure.
2. Software Requirement Analysis - Describe the individual Phases / Modules of the project, Identify deliverables.
3. Data Modeling - Use work products – Data dictionary, Use case diagrams and activity diagrams, build and test class diagrams, Sequence diagrams and add interface to class diagrams.
4. Software Development and Debugging
5. Software Testing and Debugging- Develop a test plan and test case -Perform unit, integration, system and acceptance testing on application software- Track bugs and defects- Use automated testing tools: LoadRunner, WinRunner, Selenium and Neoload test, Junit.
6. Reverse Engineering.

SUGGESTED LIST OF APPLICATIONS

1. Student Marks Analyzing System
2. Pizza Ordering Systems
3. Online Ticket Reservation System
4. Dabbawala Management System
5. Course Registration System
6. Expert Systems
7. ATM Systems
8. Stock Maintenance
9. E-Mail Client System
10. Time table Generation System

U15IT605 INTERNET OF THINGS LABORATORY 1 0 2 2

COURSE OUTCOMES

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

1. Interface various sensors with Arduino and Raspberry pi boards.
2. Implement the control applications using Arduino programming
3. Experiment the different IoT applications with Raspberry pi using Python Programming.

UNIT I SENSOR AND ACTUATORS 3

Sensors –sensor types: Light, temperature, Force and sound- Actuators-Actuator types

UNIT II OVERVIEW OF IOT 3

An example of IoT Implementation- IoT Service Oriented Architecture- IoT Categories- IoT and Associated Technologies- IoT challenges

UNIT III INTRODUCTION TO ARDUINO PROGRAMMING 3

Features of Arduino- Types of Arduino Board-Board Details-Arduino IDE Overview-Example programs

UNIT IV INTRODUCTION TO RASPBERRY PI 3

Raspberry Pi introduction – Basic Architecture –Raspberry Pi pin configuration –Basic set up for Raspberry Pi

UNIT V INTRODUCTION TO PYTHON PROGRAMMING 3

Python IDE- Data-types in Python- Functions in Python, Implementation of IoT with Raspberry Pi using Python

Total: 15 hours

TEXT BOOK

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

REFERENCES

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
2. Dr.K.V.K.K.Prasad, "Embedded Real Time Systems: Concepts, Design and Programming", DreamTech Publication, 2003.
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley Publications, 2012.
4. Introduction to IoT NPTEL video lectures by Dr. Sudip Misra, IIT Kharagpur 2017.

List of Experiments

1. Installation of Arduino IDE and Blink LED
2. Creating different LED Patterns using Loops and functions
3. Interfacing Arduino Nano with Joystick
4. Control the brightness of an LED by using PWM
5. Control servo motor using Joystick
6. Control LED, Buzzer and Relay from smart phone using Bluetooth Module.
7. Interface DHT 11 sensor with Arduino Nano and upload the humidity and temperature on the cloud.
8. Familiarization of Raspberry pi by blink LED program
9. Interface PIR sensor with Raspberry pi for motion detection.
10. Control the stepper motor using Raspberry pi based on specific input
11. Measure the humidity and temperature using DHT sensor and display the data readings on the LCD screen.
12. Build a secret code based security system using Raspberry pi

U15IT901 NUMERICAL METHODS 3 0 0 3

COURSE OUTCOMES

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

1. Solve algebraic and transcendental equations, solve the linear system of equations by direct or iterative methods
2. Apply the Newton's forward, backward and divided difference formulas and Lagrange's polynomial to obtain the polynomial interpolation and their derivatives at desired point
3. Explain 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 and multi-step methods
5. Solve the boundary value problems (BVPs) in elliptic and parabolic PDEs by finite difference approximations

UNIT – I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

Solution of algebraic and transcendental equations: Fixed point theorem (statement only) – Fixed point iteration method – Newton Raphson method.

Solution of linear system of equations: Gauss – Jordan method –Gauss – Seidel methods.

Matrix inversion by Gauss – Jordan method

UNIT – II INTERPOLATION AND NUMERICAL DIFFERENTIATION 9

Interpolation and numerical differentiation for equal intervals: Newton's forward and backward difference formulae

Interpolation and numerical differentiation for unequal intervals: Newton's divided difference interpolation – Lagrange's interpolation – inverse Lagrange's interpolation.

UNIT – III NUMERICAL INTEGRATION 9

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 – ORDINARY DIFFERENTIAL EQUATIONS 9

Single step methods: Taylor series method –Fourth order Runge – Kutta method for solving first 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 – PARTIAL DIFFERENTIAL EQUATIONS 9

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 two dimensional Laplace PDEs by Liebmann's iteration process and Poisson PDEs.

Total: 45 hours

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. Sankar Rao, "Numerical Methods for Scientists and Engineers", Third Edition, Prentice Hall of India P. Ltd., New Delhi, 2007.

U15IT934 THEORY OF COMPUTATION 3 0 0 3

COURSE OUTCOMES

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

1. Prove results using proof by induction, contradiction and understand formal definitions of automata, languages and Grammars.
2. Apply the models of Finite automata and explain the properties of languages with applications.
3. Explore the models of Pushdown automata, context free languages and describe the different forms of context free grammars.
4. Classify the different representations, techniques, extensions and simulating a Turing machine by Computer.
5. Describe concrete examples of computationally undecidable or inherently infeasible problems from different fields.

UNIT I AUTOMATA THEORY 9

Finite Automata: Constructing Automata, Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA) Equivalence of DFA and NFA: Finite Automata with Epsilon Transitions, Finite Automata without Epsilon Transitions, Subset Construction Method, Minimizing Automata - Applications of Finite Automata

UNIT II REGULAR EXPRESSIONS AND CONTEXT FREE GRAMMARS 9

Regular Expressions and Properties: Constructing Regular Expressions, Finite Automata and Regular Expressions - Conversion of RE to Automata and Automata to RE, Applications of Regular Expressions, Pumping Lemma, Closure Properties.

Context Free Grammars: Definitions and Derivations, Parse trees, Applications, Ambiguity in Grammars and Languages.

UNIT III PUSHDOWN AUTOMATA AND CONTEXT FREE LANGUAGES 9

Pushdown Automata: Definition, The Languages of a PDA, Constructing PDA's, Equivalence of PDA and CFG, Deterministic Pushdown Automata

Normal Forms and Properties: Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Pumping Lemma and Closure Properties of CFL.

UNIT IV TURING MACHINE AND RECURSIVE ENUMERABLE LANGUAGE 9

Introduction: Definition, Constructing Simple TM's, Representations, Programming Techniques – Automata with storage, Multi-tape tracks, Checking of symbols, Subroutines, Universal Turing Machine, Turing Machines and Computers

UNIT – V UNDECIDABILITY AND COMPLEXITY 9

Undecidability: Language that is not Recursively Enumerable, Undecidable Problem that is Recursive Enumerable, Undecidable Problem about Turing Machine, Post Correspondence Problem, Modified PCP

P and NP: The Class P, The class NP, The NP-Complete Problem

Total : 45 hours

TEXT BOOKS

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman "Introduction to Automata Theory, Languages, and Computation ", 3rd Edition, Pearson Education, 2008

REFERENCES

1. Kavi Mahesh "Theory of Computation – A Problem-Solving Approach", John Wiley-India, First Edition, 2012
2. A.M. Natarajan, A. Tamilarasi, P. Balasubramani "Theory of Computation ", New Age International Publishers, 2007
3. Raymond Greenlaw, H. James Hoover "Fundamentals of the Theory of Computation: Principles and Practice", Morgan Kaufmann Publishers, 1998
4. John C. Martin "Introduction to Languages and the Theory of Computation", 4th Edition, McGraw-Hill, 2010

U15IT936 MACHINE LEARNING 3 0 0 3

COURSE OUTCOMES

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

1. Explain the concepts of different types of learning and apply linear regression
2. Summarize the concepts of logistic regression and implement the same with python
3. Explain and apply the concepts of Neural networks and support vector machines
4. Evaluate the hypothesis based on factors like bias and variance
5. Explain the concepts of clustering, dimensionality reduction and anomaly detection.

UNIT I INTRODUCTION AND LINEAR REGRESSION 9

What is machine learning? – Supervised Learning – unsupervised learning – Linear Regression – cost function – gradient descent algorithm – normal equation – implementation - Gradient descent for multiple variables – feature scaling – learning rate – polynomial regression – normal equation – implementation

UNIT II LOGISTIC REGRESSION 9

Hypothesis representation – decision boundary – nonlinear decision boundaries – cost function – gradient descent – advanced optimizations – multi class classification problems – python implementation – **Regularization -** Problem of overfitting – cost function optimization for regularization – regularized linear regression – regularization with normal equation - regularized logistic regression – python implementation

UNIT III NEURAL NETWORKS AND SUPPORT VECTOR MACHINES 9

Overview and summary – neurons and brain – model representation – artificial neural networks representation – example – multiclass classification – cost function – back propagation algorithm – gradient checking – random initialization – implementation – Support vector machines – optimization objective – cost function – large margin intuition – decision boundary – kernels – adapting to nonlinear classifiers – implementation

UNIT IV ADVICE FOR APPLYING MACHINE LEARNING 9

Debugging a learning algorithm – evaluating a hypothesis – model selection and training, validation test sets – bias Vs variance – regularization and bias/variance – learning curves machine learning system design

UNIT V OTHER TOPICS 9

Unsupervised learning – k-means algorithm – optimization objective – choosing number of clusters - Dimensionality reduction – principle component analysis - Anomaly detection – algorithm – developing and evaluating the algorithm – anomaly detection Vs supervised algorithm -Case study – recommender system – collaborative filtering - Large scale machine learning – online learning – map reduce and parallelism.

Total: 45 hours

REFERENCES

1. Stanford's machine learning course presented by Professor Andrew Ng – online resource - http://www.holehouse.org/mlclass/
2. James, G., Witten, D., Hastie, T., Tibshirani, R, "An Introduction to Statistical Learning with Applications in R", Springer, 2013.
3. Tom M. Mitchell, "Machine Learning", 1st edition, McGraw Hill Education, 2017.
4. Ethem Alpaydın, "Introduction to Machine Learning", The MIT Press, 2nd edition, 2013.
5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
6. Sebastianraschka, "Python Machine Learning", Packt Publishing Ltd., 2017.

U15IT904 DISTRIBUTED SYSTEMS 3 0 0 3

COURSE OUTCOMES

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

1. Explain the principles underlying in the functioning of distributed systems
2. Comprehend major technical challenges in distributed Object
3. Explain modern and classic technologies used in distributed file systems and naming services
4. Explain the importance of time and clock in distributed systems and mutual exclusion
5. Describe distributed transactions and concurrency control in the distributed environment

UNIT I INTRODUCTION 9

Introduction: Introduction to Distributed systems, Examples of distributed systems, challenges, architectural models, fundamental models.

Inter-Process Communication: Introduction to inter process communications, external data representation and marshalling, client server communication, group communication.

UNIT II DISTRIBUTED OBJECTS 9

Distributed Objects: Introduction, Communication between distributed objects, Remote procedure call, Events and notifications, Case Study: JAVA RMI.

CORBA Case Study: Introduction- CORBA RMI- CORBA Services.

UNIT III DISTRIBUTED FILE SYSTEM AND NAMING SERVICES 9

File System: Introduction to DFS, File service architecture, Case Study: Sun network file system,

Name Services: Introduction to Name Services, Name services and DNS, Directory and directory services, Case Study: Global Name Service.

UNIT IV TIME AND DISTRIBUTED MUTUAL EXCLUSION 9

Time and Global State: Introduction, Clocks, Events and Process states, Synchronizing physical clocks, Logical time and logical clocks, Global states, distributed debugging.

Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast communication.

UNIT V DISTRIBUTED TRANSACTION AND REPLICATION 9

Distributed Transaction: Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Replication: Introduction, System model and group communications, Transactions with replicated data.

Total: 45 hours

TEXT BOOK

1. George Coulouris, Jean Dollimore, Tim Kindberg “Distributed Systems Concepts and Design” Fifth Edition Pearson Education ,2013.

REFERENCES

1. A.S. Tanenbaum and M. V. Steen, "Distributed Systems: Principles and Paradigms", Second Edition, Prentice Hall, 2016.
2. M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.
3. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman&Hall/CRC, Taylor & Fransis Group, 2007.
4. Mukesh Singhal, “Advanced Concepts In Operating Systems”, McGrawHill Series in Computer Science, 2011.

U15IT905 ADVANCED JAVA PROGRAMMING 3 0 0 3

COURSE OUTCOMES

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

1. Develop distributed application using RMI and CORBA concepts
2. Write networking programs using a built-in package in Java
3. Apply server side programming concepts to develop enterprise application and Implement the business logic using EJB in J2EE application
4. Apply the concept of ORM using Hibernate in storing persistent objects
5. Develop a MVC based web applications using spring frameworks

UNIT I DISTRIBUTED APPLICATION 9

Remote Method Invocation: RMI Basics – JRMP – RMI Interfaces – RMI Servers and Skeletons – RMI Registry - RMI Registration – Lookup - Object Activation Models -CORBA- ORB – IDL Technology - CORBA Communications.

UNIT II NETWORKING APPLICATION 9

Network Computing – TCP/IP Roots – Communication layers – Socket Programming-UDP Datagrams- Custom Sockets and Factories

UNIT III ENTERPRISE APPLICATION 9

J2EE Architecture – Components –Server Side Programming: Servlets and JSP - Enterprise Java Beans – Types: session, entity and message driven bean – AJAX- Internals- XML HttpRequest Object- AJAX UI Tags

UNIT IV HIBERNATE 9

Problem with JDBC – ORM – Components of Hibernate Architecture – Persistent Operations – Hibernate Query Language

UNIT V JAVA FRAMEWORK 9

Introducing Spring 3.0: The Dependency Injection container – Building web application with spring web MVC – Basic Web Forms – Enhancing MVC application with Web Flow – Authentication and Authorizing a user request – Implementing Hibernate with Spring

Total: 45 Hours

TEXT BOOKS

1. Paul J Perrone, Venkata S.R. Krishna R and Chayanti, "Building Java Enterprise Systems with J2EE", Techmedia , New Delhi, 2008.
2. Willie Wheeler and Joshua White "Spring in Practice", First Edition Manning Publications, 2013.
3. Santhosh Kumar K, "SPRING and HIBERNATE", Second Edition, Tata McGraw Hill, 2013.

REFERENCES

1. Hortsmann & Cornell, "CORE JAVA 2 ADVANCED FEATURES, VOL-II", 9th edition, Prentice Hall, 2013.
2. Ed Roman, Rima Patel Sriganesh and G erald Brose "Mastering Enterprise Java Beans", Third Edition, John Wiely & Sons, 2005
3. Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", Pearson, 2007.

U15IT923 MULTIMEDIA SYSTEMS 3 0 0 3

COURSE OUTCOMES

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

1. Explain the relevance and underlying infrastructure of the multimedia systems
2. Comprehend core multimedia technologies and standards (Digital Audio, Graphics, Video, Text, and Animation, Authoring tools)
3. Apply the concepts of Multimedia Networks and Multimedia Retrieval
4. Apply the concepts of Multimedia involve in Web
5. Explain the concepts of Multimedia involve in Design (Text, image, sound, animation)

UNIT I MULTIMEDIA ELEMENTS 9

Introduction – Definitions – Applications – Elements - Text – Image/Graphics Audio – video Animation.

UNIT II MULTIMEDIA TOOLS 12

Macintosh and windows production platforms - 3-d modeling and animation – image editing tools - sound editing tools - animation - video - and digital movie tools - linking multimedia objects - office suites - word processors - spread sheets - databases - presentation tools. Authoring tools - Card and Page-based authoring tools - Icon Based authoring tools - time based authoring tools - object oriented authoring tools - cross platform-authoring tools.

UNIT III MULTIMEDIA STORAGE AND MANAGEMENT 9

Storage and Retrieval and presentation-Synchronization Issues - Multimedia Operating Systems and Multimedia databases – Hypertext - Hypermedia Architectures.

UNIT IV MULTIMEDIA AND INTERNET 9

Internet fundamentals: Internetworking - Connections - Internet services - The World Wide Web - Tools for the World Wide Web: Web serves - Web browsers - Web page makers and Site builders - Plug-ins and Delivery vehicles - Beyond HTML.

UNIT V DESIGNING FOR WORLD WIDE WEB 6

Working on web - Text for web - Images for web - Sound for web - Animation for web.

Total : 45 hours

TEXT BOOKS

1. Tay Vaughan, “Multimedia: Making It Work”, Ninth Edition, Tata Mc- Graw hill, New Delhi, 2014.
2. Ralf Steinmetz and Klara, “Multimedia Computing, Communications and Applications”, Pearson Education, 2006.
3. K.Andleigh, Kiran Thakrar, Multimedia Systems Design, PHI, 2007.

REFERENCES

1. Donald Hearn and M.Pauline Baker, “Computer Graphics C Version”, Pearson Education, New Delhi, 2003.
2. Prabat K Andleigh and Kiran Thakrar, “Multimedia Systems and Design”, PHI Learning, New Delhi, 2003.
3. Ze Nian Li, S. Drew, “Fundamentals of Multimedia” , PHI,2006.
4. Fred Halsall, “Multimedia Communications- Applications, Networks, Protocols and Standards , Pearson Education, 2007.

Semester –VI	U15GE601B :SOFT SKILLS AND APTITUDE -IV	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 job-oriented company selection processes using the hands-on approach

2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests

3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in placement specific internal tests

1. Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. Mock group discussions b. Mock interviews c. Mock stress interviews
2. Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Progressions b. Heights and Distances c. Simple Interest d. Compound Interest e. Calendars f. Area and Perimeter g. Volume and Surface Area h. Boats and Streams i. Data Interpretation j. Puzzles k. Artificial Language l. Mathematical Operators m. Statement and Conclusion n. Data Sufficiency o. Geometry p. Company specific aptitude questions
3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Story a story for given pictures g. Company specific aptitude questions

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

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit
Theory							
1	U15GE602B	Principles of Management		3	0	0	3
2	U15FT601	Apparel Merchandising and Marketing		3	0	0	3
3	U15FT602	Textile Testing and Quality Assurance in Apparel Production		3	0	0	3
4	U15FT603	Industrial Engineering in Garment Production		3	0	0	3
5	U15FT906	Elective	Product Engineering and Plant Layout	3	0	0	3
	U15FT908		Clothing Size and Fit				
	U15FT909		Advances in Garment Production				
6	U15EE1002	Open Elective	Energy Conservation and Management	3	0	0	3
	U15ME1002		Industrial Robotics				
	U15ME1003		Industrial Safety				
	U15CE1003		Natural Disaster Mitigation and Management				
	U15IT1003		Problem Solving Techniques Using Java Programming				
	U15IT1004		Python Programming				
	U15ME1005		Renewable Energy Sources				
Practical							
7	U15FT604	Textile Testing and Quality Control Laboratory		0	0	2	1
8	U15FT605	Garment Construction Laboratory – III		0	0	4	2
9	U15FT606	In-Plant Training		0	0	0	1
10	U15GE601B	Soft Skills and Aptitude – IV		0	0	2	1
						Total Credits	**23**

Approved By

Chairman, Fashion Technology BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.G.Gunasekaran	Dr.R.Shivakumar	Dr.M.Usha

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

U15GE602B PRINCIPLES OF MANAGEMENT 3 0 0 3

COURSE OBJECTIVE

To enable the students to impart knowledge on management concepts

COURSE OUTCOMES

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

1. Explain the fundamental concepts and principles of management, including the basic roles, skills, and functions of management along with the knowledge of historical development of management process
2. Explain the role of planning and understand the process of planning which includes setting of objectives, strategies, policies and plans and be familiar with the steps in the forecasting and decision-making process
3. Outline the importance and different forms of organising function, explain different organisational charts stating its authority delegation; Explain the function of staffing which involves managing organization structure through proper and effective selection, appraisal and development of the personnel to fill the roles assigned to the employers/workforce
4. Define leadership and identify traits of effective leaders and describe the behaviours that effective leaders demonstrate; State the need for motivation and the types and theories of motivation; Define communication and understand the communication process and list the barriers to effective communication
5. Explain the process and importance of the controlling function and the various organisational control techniques; Provide an overview of the global business management practices and issues

UNIT- I Management Concept and Historical Development 9

Nature and Functions of Management: Definition and importance of Management, Management as a Science or an Art, Management and Administration, Levels of management, Functions of Management

Development of Management Thought: Early Classical Approaches, Neo-Classical approaches, Modern approaches, Contribution of F. W. Taylor and Henry Fayol, Basic forms of business ownership

UNIT - II Planning and Decision Making 9

Foundations of Planning: Importance of Planning, Steps involved in Planning, Types of plans

Objectives, strategies and planning: Characteristics and types of objectives, Process of setting Objectives, Strategic planning, SWOT analysis, Significance and types of policies, Steps in policy formulation

Managing by Objectives: Elements of MBO system, Advantages and limitations of MBO

Forecasting and Decision Making: Characteristic of a good forecast, Classification of forecasting techniques, Problem solving and decision making, Types of decision making, Certainty, Risk, Uncertainty and ambiguity in decision making

Unit - III Organising and Staffing 9

Fundamentals of Organising: Nature and importance of organisation, Steps in organising, Forms of organisation –Line, line and staff, Functional, Group organisations

Organisation Structure: Formal and informal organizations, Organization Chart – Types, Benefits and Pitfall, Departmentation by difference strategies

Authority Delegation and De-Centralization: Elements of delegation, Delegation process, Centralisation, Decentralisation, Formalisation

Staffing: Manpower planning, Employee recruitment, Selection, Training, Performance appraisal, Human Resource Development (HRD) – principles, framework, challenges and benefits

Unit - IV Leadership, Motivation and Communication 9

Leadership styles and theories: Characteristics and functions of leadership, Types of leadership, Leadership styles, Theories, roles of leader

Motivation: Nature and importance of motivation, Types of motivation, Motivational theories

Communication: Importance and characteristics, Formal and informal communication, Forms of communication process, Barriers to effective communication, Overcoming the barriers

Unit - V Controlling and Globalisation 9

Controlling: Nature and need for control, Steps in control process, Organisational control techniques – Budgetary control techniques, Management auditing, Information and financial analysis, Break even analysis, Requirements for effective control system

The Global Environment: Globalisation and Liberalisation, Forms of International business, Benefits of globalisation, MNC, Global theories

TOTAL: 45 hours

TEXT BOOKS

1. Harold Kooritz and Heinz Weihrich, **Essentials of Management**, Tata McGraw-Hill, New Delhi,1998
2. Joseph L. Massie, **Essentials of Management**, Prentice Hall of India, Pearson Fourth Edition, New Delhi, 2003

REFERENCES

1. Tripathy P. C. and Reddy P.N., **Principles of Management**, Tata McGraw-Hill, New Delhi, 1999
2. Decenzo David and Robbins Stephen A. , **Personnel and Human Resource Management**, Prentice Hall of India, New Delhi, 1996
3. JAF Stomer, Freeman R. E and Daniel R Gilbert, **Management**, Pearson Education, Sixth Edition, New Delhi, 2004

U15FT601 APPAREL MERCHANDISING AND MARKETING 3 0 0 3

COURSE OBJECTIVE

To enable the students to impart knowledge on marketing, fashion merchandising, sourcing, pricing and types of document preparation

COURSE OUTCOMES

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

1. Describe the various types of market and advertising techniques involved in merchandising
2. Discuss the types and functions of merchandising
3. Explain the principles and techniques of fashion merchandising
4. Discuss the technology involved in sourcing, material management systems and pricing
5. Describe the time management in merchandising

Unit – I Marketing 9

Apparel marketing: Definition, Scope, Functions and strategies of marketing.

Market Research: Market Research, marketing strategies, study of markets – textile markets, International market, Domestic market, Retail and wholesale market - brand marketing.

Advertising: Purpose, Methods, Types of advertising media; Sales promotion techniques.

Unit – II Merchandising 9

Apparel merchandising: Definition, Functions of merchandising division, Roles and responsibilities of merchandiser.

Types of merchandising: Principles and techniques of apparel merchandising, Retail merchandising, Visual merchandising; Interfacing merchandising with production.

Types of buyers: Communication with buyers and consumers; consumer demand –consumer behaviour in fashion.

Unit – III Fashion Merchandising 9

Fashion merchandising: Principles and techniques of fashion merchandising, Components of fashion, principles of fashion, Leaders of fashion; Foreign fashion markets, Fashion shows, Fashion retailing trends.

Unit – IV Pricing and Sourcing 9

Pricing: Pricing theory, Factors affecting price structure in apparel.

Sourcing: Definition, Need and important factors in sourcing, Methods of sourcing, sourcing of accessories; – linings – buttons – zippers – labels. Supply chain management – Manufacturing resource planning; JIT technology.

Unit – V Time Management 9

Time management in merchandising, Production scheduling, Route card format, Accessories follow up; Practical check points; Computer applications in marketing and merchandising.

Total: 45 hours

TEXT BOOKS

1. Moore Evelyn C., **Path for Merchandising- A Step by Step Approach**, Thames and Hudson Ltd., London, 2001.
2. Vijay Barotia, **Marketing Management,** Mangal Deep Publication, New Delhi, 2001.

REFERENCES

1. Jarnow J. and Dickerson K. G., **Inside the Fashion Business**, Prentice Hall, New Delhi, 1997.
2. Laine Stone and Jean Samples, **Fashion Merchandising**, McGraw Hill Books, Singapore, 1985.

U15FT602 TEXTILE TESTING AND QUALITY ASSURANCE IN APPAREL PRODUCTION **3 0 0 3**

COURSE OBJECTIVE

To impart knowledge about the sampling techniques, different methods of testing procedure for fibre, yarn and fabric and apparel., quality, inspection, quality assurance, control forms, production flow charts, quality control aspects for fabrics and garment manufacturing processes, the standards and tolerances used in the garment industries.

COURSE OUTCOMES

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

1. Elucidate the various principles and methods are used for fibre and yarn properties testing
2. Describe the different methods and procedure is used for fabric properties testing
3. Discuss the basic terms and definition of apparel testing and methods of evaluation
4. Explain quality and its necessity, various systems of inspection, differences between quality assurance and inspection and different types of control forms used in garment industries.
5. Elaborate on the quality control of fabrics and QC in different departments of a garment unit, quality standards and tolerances to be adopted in various sections of garment production.

Unit – I Sampling Techniques, Fibre and Yarn Testing **9**

Sampling Techniques: Definitions of random and biased samples; Sampling techniques for fibre, yarns and fabrics.

Fibre Testing: Testing of cotton using the rapid fibre testing methods- High Volume Instrument (HVI) and AFIS.

Yarn count: Definitions of count, Yarn numbering system; determination of yarn count using wrap reel.

Yarn Twist: Definitions of Twist, determination of twist of single and ply yarn.

Yarn strength: Single yarn strength tester and Lea strength tester.

Yarn Evenness and hairiness: Yarn appearance board winder. Classification of variations in yarn, methods of measuring yarn evenness and hairiness, Uster evenness tester.

Unit – II Fabric Testing **9**

Fabric Strength Testing: Fabric tensile strength tester, Ravelled strip method, Elmendorf tearing strength tester, Hydraulic bursting strength tester.

Fabric performance Testing: Martindale abrasion resistance tester, **Fabric pilling:** ICI pillbox tester.

Fabric drape and stiffness: Definition of Drape and Stiffness, Drape meter, SHIRLEY stiffness tester, Fabric crease resistance and crease recovery tester.

Fabric Permeability: Terms in air permeability and water permeability, SHIRLEY air permeability tester, Water permeability testers.

Unit – III Apparel Testing **5**

Seam strength: Definition of Seam strength, Seam puckering, Evaluation of interlining quality.

Apparel testing: Dimensional stability, durable press evaluation, Snap/button pull strength testing.

Unit – IV Quality, Inspection, Quality Assurance, Control Forms **11**

Quality: Introduction, Definition, Control of quality and its necessity.

Inspection: Importance of inspection, Functions of inspection, Systems of inspection, Types of inspection, Raw material inspection, In-process inspection, Final inspection, 100% inspection, Sampling inspection, Comparison of 100% and sampling inspections. AQL Standards, Self inspection method.
Quality assurance – Definition, Differences between quality assurance and inspection; Inspection Agencies.
Control forms: Types of control forms and its examples.

Unit – V QC for Fabrics, QC in Garment Manufacturing Processes, Quality Standards, Tolerances and Cost of Quality 11

QC for fabrics: Quality control for fabrics, Types of defects in fabrics, Major, Minor and Critical faults, fabric inspection system.
QC in garment manufacturing processes: Quality control in pattern making, Grading, Marking and marker efficiency, Quality control in stitching, Quality control of trims accessories.
Quality standards and tolerances: Quality standards and tolerances and for fabrics, Spreading, cutting, Stitching in garment industry, Tolerances and quality standards for finished garments. Quality assurance system and standards for packing and packed goods, Warehousing and shipping

TOTAL: 45 hours

TEXT BOOKS

1. Angappan P and R.Gopalakrishnan , "**Textile Testing**"-S.S.M.I.T.T Co-op stores Ltd.,2007.
2. Koushik C.V. and R. Chandrasekaran, "**Textile Testing**"-NCUTE publication, New Delhi, 2004.
3. Jacob Solinger, **Apparel Manufacturing Handbook**, Prentice Hall, New Jersey, 1993.

REFERENCES

1. J. E. Booth, **Principles of Textile Testing**, CBS Publishers and Distributors, New Delhi, 1996.
2. B. P. Saville, **Physical Testing of Textiles**, CRC Woodhead Publishing, New Delhi 1999.
3. V.K. Kothari, **Quality Control and Testing Management**, IAFL Publications, New Delhi, 1999.
4. Samuel Eilon, **Production Planning and Control**, Macmillan, New York, 1962.
5. Grover E. G. and Hamby D. S., **Hand Book of Textile Testing and Quality Control**, Wiley Eastern Pvt. Ltd., New Delhi, 1969.
6. Pradip V. Mehta, **An Introduction to Quality Control for the Apparel Industry,** Dekker, 1992.

U15FT603 **INDUSTRIAL ENGINEERING IN GARMENT PRODUCTION** **3 0 0 3**

COURSE OBJECTIVE

To enable the students to impart the concept of industrial engineering, method study, the importance of the process of work measurement, plant layout, planning tools and material handling systems related to the apparel industry.

COURSE OUTCOMES

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

1. Explain the importance of productivity and discuss the role of industrial engineer in the garment industry
2. Discuss the various procedure and techniques involved in method study
3. Explain the objectives and procedure to measure work content in the garment industry and also discuss its importance
4. Explain the importance of plant layout and analyze the lean manufacturing technology in the garment industry
5. Discuss the various planning, control tools and material handling systems used by industrial engineer in garment industries

Unit – I Introduction **9**

Productivity: Production, Productivity, types of productivity, Productivity measures, Factors affecting productivity in garment industry, Measurement of line efficiency.

Industrial engineering: Definition, Benefits, Roles and responsibilities of industrial engineer in apparel industry.

Unit – II Method Study **9**

Method study: Definition, Objectives, Basic procedure, Value Added and Non Value Added activity analysis.

Process chart: Flow process chart, Flow diagram, Multiple activity chart, Travel chart, String diagram.

Motion economy: Principles of motion economy, Classification of movements, Micro-motion study, Ergonomics .

Unit – III Work Measurement **9**

Work Measurement: Definition, Objective, Techniques.

Time study: Definition, Steps in making time study, Breaking the job into elements, Stop watch procedure, Pre-determined motion time study.

Standard Time: Rating factor, Allowances, Mechanism of arriving SAM.

Unit – IV Plant Layout **9**

Layout: Objectives, Steps in planning layout, Types of layout, importance of Plant location, Work area planning.

Lean manufacturing: Definition, Objective, Concepts and principle, SMED technique.

UNIT – V Planning and Control **9**

Planning: Cost per minute, Learning Curve, Preparation of operation bulletin, Development of skill matrix, Thread consumption, Estimation of On-standard and Off-standard time.

Line balancing: WIP, factors influence on line balancing Techniques, pitch diagram analysis.

Material handling: Definition, Objective, Classification of material handling equipment in apparel industries.

TOTAL: 45 hours

TEXTBOOKS

1. Khan M.I **"Industrial Engineering",** New Age International, 2004.

REFERENCES

1. Cooklin Gerry, "**Introduction to Clothing Manufacture**", Blackwell Science Ltd., 1995.
2. Johnson Maurice "**Introduction of Work Study**", International labour Organization, Geneva, 1995.
1. Solinger Jacob "**Apparel Manufacturing Hand Book**", Reinhold Co, 1998.
2. Ralph M Barnes, "**Motion and Time Study Design and Management of Work**", Seventh Edition, John Wiley and sons, New York, 1980.
3. Khanna O.P "**Industrial Engineering and Management**" Danpat Rai and Sons, New Delhi, 1987.

PROFESSIONAL ELECTIVE II

U15FT906 PRODUCT ENGINEERING AND PLANT LAYOUT 3 0 0 3

COURSE OBJECTIVE

To enable students to impart the concept of product analysis, Industrial Engineering, MIS, cost control, capacity planning and inventory control system.

COURSE OUTCOMES

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

1. Develop a clear understanding about product analysis
2. Explain the concept of production control and MIS
3. Describe the process control and engineering concepts on cost control
4. Explain the plant loading and capacity planning for the execution of the order within the target date
5. Explain the importance and application of material management and inventory control systems

Unit -I Product Analysis 9

Product Analysis: Relationship between quality and construction of sewn product geometric principles of draping, drafting and industrial patterns product specifications.

Unit-II Production Control and Engineering 9

Production control and Engineering: Industrial engineering concepts - Development and application of standard data for pre-costing and factory scheduling - Basic production systems - production control charts. Manufacturing Information system: Systems and procedures.

Unit-III Production Management Analysis 9

Production Management analysis : Analysis of techniques for material utilization and cutting of raw materials for all types of sewn products principles and methods of costing, Spreading, Cutting, Marking and ticketing - Solution of production problems in spreading, Cutting and cost control, Principles for improving sewing operations.

Unit-IV Plant loading and capacity planning 9

Plant loading and capacity planning: Determination of machinery requirements for a new factory, Calculation of labour requirements, Application of line balancing techniques. Establishing factor capacity, planning for multi style production – Preparation of planning board.

Unit-V Materials management and Inventory control systems 9

Materials management: Management Resources Planning (MRP), Just in time production system (JIT), Optimised production technology (OPT), Economics order quantity (EOQ).

Inventory control: Various inventory modeling – Case studies related to apparel industry

TOTAL: 45 HOURS

TEXT BOOK

1. Rajesh Bheda, "**Managing Productivity of Apparel industry**" CBI publishers, New Delhi (2002).
2. Jacob Solinger., "**Apparel Manufacturing Handbook**", VanNostrand Reinhold Company (1980).

REFERENCE

3. Bethel , Tann , Atwater and Rung., " **Production Control** ", McGraw Hill Book Co., New York, (1948).
4. Biegel , John. E., " **Production Control** ", **A Quantitative Approach** " Prentice Hall Inc., (1971) 2nd edition.
5. Apple. J. M., " **Plant Layout and Materials Handling** ", The Ronald Press Co., New York (1950).
6. Immer , John. R., " **Layout Planning Techniques** ", McGraw Hill, New York, (1950).

U15FT907 GREEN PROCESSING OF TEXTILES 3 0 0 3

COURSE OBJECTIVE

To enable students to explain eco standards, eco labels, eco-testing, and eco friendly processing techniques.

COURSE OUTCOMES

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

1. Explain the concept eco standards and different eco labels
2. Explain the eco testing of textiles
3. Explain the different approaches to eco friendly processing
4. Explain the advanced processing techniques to minimise the pollution
5. Discuss in detail about the enzymatic processing of textiles

Unit – I Eco Standards and Eco-Labels 9

Regulations concerning azo dyes- banned amines, Pesticides, Heavy metals, Formaldehyde and Pentachlorophenol in textiles. Global eco standards and eco-labels. Ecomark scheme of India. Criteria for an eco-label based on the life cycle. Now Green Tag for ZLD system treatment based textile products.

Eco-Management: Concept of eco-management, eco-audit, certification and labeling of eco-friendly textiles.

Unit – II Eco-Testing of Textiles 9

Testing of banned chemicals such as free formaldehyde, pesticides, pentachlorophenol, heavy metals, azo dyes containing aromatic amines &benzidine and halogen carriers. Principle of Instruments used – Chromatography (HPLC, GC) and Mass Spectrometry and Atomic Absorption/Emission Spectrometry.

Unit – III Approach to Eco-Friendly Processing 9

Concept of Sustainable Textiles**,** Fibre origin, Approach and Alternative methods/chemicals in Pre-treatments, Eco-friendly dyes and dyeing, Eco-Friendly Finishing – formaldehyde free finishing, Halogen free FR finish, Comfort and Hygiene Finishing using natural agents like Neem - Aloe vera – Chitosan for anti-microbial finishing.

Unit – IV Advanced Processing Techniques 9

Principle and advantages of dry processing. Plasma treatment – principle, plasma as a source of reducing the effluent and energy consumption, as a source of enhancing the dyeing properties, as a source of finishing of textiles in eco-friendly manner. Super critical carbon dioxide processing of textiles, Laser modification, Dielectric Barrier Discharge, and Corona. Electrochemical reduction - Ultrasonic dyeing. Concept of low level application of chemicals.

Unit – V Enzymatic Processing of Textiles 9

Enzyme treatments: Enzymes in preparatory processes - desizing, scouring, bleaching – Amylase, pectinase, protease, catalase, lipase etc. Enzymes used as discharging agents in printing – Laccase, Enzymes used in finishing – Bio finishing by cellulase. Enzymes for surface modification of natural fibres.

Total: 45 hours

TEXT BOOKS

1. "**Eco -Textiles, Special report**", The Bombay Textile Research Association, Mumbai, February, 1996.
2. "**Eco friendly Textiles: Challenges to the Textile Industry**", Textiles Committee, Mumbai, 1996.
3. Chavan R B, Radhakrishnan J, "**Environmental Issues - Technology Options for Textile Industry**", IIT Delhi Publication, 1998.

REFERENCES

1. Miraftab M and Horrocks A R, "**Eco Textiles**", The Textile Institute, Woodhead Publication Ltd., Cambridge, 2007.
2. Susanna Benny and Janakiraman K P, "**Eco parameters: Present Status**", Mill Control Report No.15, The South India, Textile Research Association, Coimbatore, 1998.
3. "**Oko-tex Standard 100**", International Association for Research and Testing in the field of Textile Ecology (Oko- tex), Zurich, Switzerland, January, 1997.
4. "**Eco Textiles**", Book of Papers, BTRA, 1996.
5. Asokan R, "**Eco-Friendly Textile Wet Processing**", NCUTE Publications, New Delhi, 2001.
6. **Reife A, and Freeman H S, "Environmental** Chemistry of dyes and pigments", Wiley, 2001.
7. Shishoo R, "**Plasma Technologies for Textiles**", Woodhead publishing limited, Cambridge, 2007.
8. Cavaco-Paulo A and Gübitz G M, "**Textile Processing with Enzymes**", Woodhead publishing limited, Cambridge, 2003.

U15FT908 CLOTHING SIZE AND FIT 3 0 0 3

COURSE OBJECTIVE

To impart knowledge about human anthropometrics and size systems, method of evaluation of clothing fit and clothing appearance, Principle of 3D body scanning, virtual garmenting and various men's and women's garment fitting solutions.

COURSE OUTCOMES

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

1. Define anthropometry and sizing system. Explain the principles of sizing systems and also categorise the sizes for men, women and children wear
2. Discuss about the subjective evaluation and objective evaluation of clothing fit
3. Explain the properties of fabrics which determine the clothing appearance and fit and also discuss the objective evaluation of wrinkle, pilling, seam pucker and overall appearance
4. Explain the principle and operation of 3-D body scanning technologies
5. Describe the 3-D apparel design systems for pattern generation and fit, virtual garmenting. Suggest the solutions for solving fitting problems in garments used regularly

Unit – I Human Anthropometrics and Sizing Systems 8

Basics of sizing systems: Definition, Traditional anthropometry, Development of sizing system, International sizing, Principles of Sizing system, Size categories in Menswear, women's wear and children's wear.

Unit – II Evaluation of Clothing Fit 10

Subjective Evaluation of Clothing Fit: Definition of Fit, Importance of Fit, Standards of Fit, influence of clothing Fit, Testing methods for dimensional Fit, Subjective rating scales, Subjective fitting guide.

Objective Evaluation of Clothing Fit: Fit Formula, Algebraic evaluation of clothing Fit, Pressure evaluation of clothing Fit.

Unit – III Objective Evaluation of Clothing Appearance 8

Objective Evaluation: Formability – Tailorability; Fabric properties related to clothing appearance and fit, Objective evaluation of fabric wrinkling, Fabric pilling, Seam Pucker and Overall garment appearance.

Dimensional Stability: Factors that affect hygral expansion, relaxation shrinkage, swelling shrinkage, Dimensional stability to washing.

Unit – IV 3-D Body Scanning 8

3D Body scanner: Application of 3D body scanner, Global development of body scanners, Challenges of body scanning, Working principle of 3D body scanner: Layer scanning, white light pattern scanning, Image processing method.

Unit – V Garment Design for Individual Fit 10

Virtual fit: Pattern alteration for fit, Three-dimensional apparel design systems for pattern generation and garment fit, Virtual garmenting.

Fitting Solutions: Trouser, sari blouse, Skirt, Ladies' top, Shervani -Analysing the causes for poor fit, solving fitting problems.

Total: 45 hours

TEXT BOOKS

1. Fan J., Yu .W and Hunter L., **Clothing Appearance and Fit,** Textile Institute, Woodhead Publishing Limited, England, 2004.
2. Lynn Maclntyre and Marcy Tilton, **Easy Guide to Sewing**, Taunton Press Inc., USA, 2009.
3. **The Perfect Fit: Classic Guide to Alter Patterns**, Creative Publishing International, USA, 2005.

REFERENCES

1. Sandra Betzina, **Fast Fit-Easy Pattern Alterations for Every Figure**, The Taunton Press Inc., Singapore, 2003.

RELATED JOURNALS

1. **Journal of Textile & Apparel Technology and Management**, North Carolina, USA **International Journal**.
2. **Stitch World -** Industry magazine. (stitchworld.net)
3. **Apparel Views** magazine (www.apparelviews.com)

U15FT909 ADVANCES IN GARMENT PRODUCTION 3 0 0 3

COURSE OBJECTIVE

To provide a broad overview of advances in the Apparel Industry

COURSE OUTCOMES

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

1. Explain the new product development and application areas
2. State the need and benefits of advanced automated fabric inspection
3. Describe the technological advances in digital printing on improved apparel production
4. Explain the technological advances in sewing
5. Describe the latest technological developments in pressing technology

Unit – I Apparel Product Development 9

Apparel Product: Introduction, process model for clothing product development, models of new product development, product development tools and application areas, product lifetime management (PLM), demand-led new product development.

Unit – II Automated Fabric Inspection 9 Fabric Inspection: Introduction, the principles of automatic fabric inspection, Fabric Quality – Kawabata Evaluation System, Fabric Assurance by Simple Testing (FAST), automating the results of objective reporting and analysis in KES-F, development of the main analysis form.

Unit – III Digital Printing of Textiles for improved apparel production 9 Digital Printing: Introduction, advances in digital printing technology, design potential and limitations of digital textile printing, digital textile printing, its role to enhance industry apparel production, applications.

Unit – IV Technological Advances in Sewing 9

Sewing: Introduction, the history of sewing, examples of sewn products, development of the industrial sewing machine, advances in sewing needle design, advances in sewing thread technology, advances in sewing machine automation, semi automatic equipment, machines using computer numerical control, future trends in clothing technology- Bonded garments, Stitch-less garments.

Unit – V Developments in Pressing Technology 9

Pressing: Introduction, the pressing process, pressing with pressure, pressing without pressure, crease resistant finishes, permanent creases, recent trends in apparel pressing technology.

TOTAL: 45 HOURS

TEXTBOOKS

1. C.Fairhurst, **"Advances in Apparel Production",** Woodhead Publishing Limited, 2008.

REFERENCES

1. **The Apparel Production Sourcebook**, Asian Edition, The Fashiondex, Inc., New York, 1999.
2. **Apparel Design and Production Handbook**, American edition, The Fashiondex, Inc., New York, 1999

U15FT910 FASHION COMMUNICATION 3 0 0 3

COURSE OBJECTIVE

To enable the students to, impart knowledge on how fashion communicates with the society and its impact on it.

COURSE OUTCOMES

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

1. Explain the terms on fashion and clothing
2. Discuss how fashion plays its role on the society
3. Describe about the clothing and its impact on the wearer
4. Describe about the fashion revolution that takes place in the society
5. Explain about fashion clothing and its performance.

Unit – I Fashion and Clothing 9

Terms - Fashion, Style, Clothing and Dress, Fashion and Anti fashion, Fashion clothing and Deception, Fashion clothing and Communication, Fashion clothing and culture, Fashion power and Ideology.

Unit – II Function of Fashion 9

Clothing Material function – protection, modesty and concealment, immodesty and attraction, Cultural functions – communication, individuality expressions, social status, social role, economic status, political status, religious status, social rituals, recreation.

Unit – III Fashion Clothing and Meaning 9

Meaning as external to the garment / image / ensemble – meaning as internal to the garment/image/ensemble – semi logical accounts of meaning – writing about the fashion and clothing.

Unit – IV Fashion Clothing and Society 9

Fashion clothing and class, fashion clothing, sex and gender, Fashion clothing and revolution: revolution and resistance, passive and active consumption, the new look.

Unit – V Fashion Clothing and Post Modernity 9

Fashion and modernity, fashion and post modernity, fashion art, performance, masquerade fashion and allegory, fashion and un-decidability, fashion and pastiche, fashion and bricolage, fashion and ambivalence**.**

TOTAL: 45 HOURS

TEXTBOOK

1. Malcolm Barnard, "**Fashion as Communication**", 2nd edition, Taylor & Francis Books Ltd., UK, 2002.
2. Maurice J.Johnson and Evelyn C.moore, **Apparel Product Development**, Prentice HallInc., 2001.

REFERENCES

1. Fortunati and Katz, Riccini, "**Mediating the Human Body Technology, Communication, and Fashion**", 1st edition, Lawrence Erlbaum Associates Publishers, USA, 2003.
2. Fred Davis, "**Fashion, Culture, and Identity**", University of Chicago Press, USA, 1994.
3. Shepherd and Rothenbuhler, "**Communication and Community**", 1st edition, Lawrence Erlbaum Associates, USA, 2001.
4. Greene and Burleson, "**Handbook of Communication and Social Interaction Skills**" 1st edition, Lawrence Erlbaum Associates Publisher, 2003.

U15FT604 TEXTILE TESTING AND QUALITY CONTROL LABORATORY 0 0 2 1

COURSE OBJECTIVE

To impart practical knowledge on determination of various yarn and fabric properties.

COURSE OUTCOMES

At the end of study of the course students able to,

1. Prepare the test specimen and determine the various yarn properties.
2. Prepare the test specimen and determine the various fabric properties.

LIST OF EXPERIMENTS

1. Determination of yarn count, lea strength and CSP (2 sessions).
2. Determination of single yarn strength (1 session).
3. Determination of yarn evenness grades using yarn-appearance boards (1 session).
4. Determination of single yarn and double yarn twist (1 session).
5. Determination of fabric tensile strength, seam strength and seam slippage properties (1 session).
6. Determination of fabric abrasion resistance by using Martindale abrasion tester (1 session).
7. Determination of fabric bursting strength by using hydraulic bursting tester (1 session).
8. Determination of fabric tearing strength by using Elmendorf tearing tester (1 session).
9. Determination of fabric stiffness and crease recovery angle (1 session).
10. Determination of pilling tendency of fabric by using ICI pill box tester (1 session).
11. Determination of drape coefficient of fabric by using drape meter (1 session).
12. Determination of course length of knitted fabric by using course length tester (1 session).
13. Determination of air permeability of fabric testing (1 session).
14. Determination of Wickabiliy of fabric (1 session).
15. Analysis of Seam puckers (1 Session).

TOTAL: 45 hours

Textile Testing and Quality Control Laboratory
List of equipment required for a batch of 30 students

S. No.	Name of the equipment / software	Quantity Required
1.	Electronic Balance	1
2.	Automatic Wrap Reel	1
3.	Lea Strength tester	1
4.	Yarn appearance tester	1
5.	Single yarn twist tester	1
6.	Fabric tensile strength tester	1
7.	Double yarn twist tester	1
8.	Martindale abrasion tester	1
9.	Fabric bursting strength tester	1
10.	Fabric stiffness tester	1
11.	Fabric crease recovery tester	1
12.	Drape meter	1
13.	Beesley's Balance	4
14.	Air-permeability tester	1
15.	Course length tester	1
16.	Crimp tester	2
17.	Single yarn strength tester	1
	Total	**21**

U15FT605 GARMENT CONSTRUCTION LABORATORY - III 0 0 4 2

COURSE OBJECTIVE

To provide opportunities for the students to, impart practical knowledge on method of taking measurements, drafting procedures and garment construction skills of various ladies traditional, and casual, western and intimate wears.

COURSE OUTCOMES

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

1. Explain the method of taking measurements for traditional wear and describe the process involved in pattern making and the construction of traditional wear
2. Describe about casual wear, the drafting procedure and the steps involved in its construction
3. Explain the method of taking measurements for western wear, draft and construction of western wear.
4. State the importance of lingerie and demonstrate the process of pattern drafting and construction of lingerie.

Construction of traditional wear

1. Ladies Salwar (1 session).
2. Ladies Kameez (1 session).
3. Ladies Churidhar (2 sessions).
4. Ladies Sari Blouse (1 session).

Construction of casual wear

5. Ladies Night Dress (2 sessions).

Construction of western wear

6. Ladies Top (1 session).
7. Ladies Skirt (1 session).
8. Ladies Trousers (2 sessions).

Construction of intimate wear

9. Ladies Brassieres and Panties (1 session).

TOTAL: 45 hours

Additional Practical Sessions – 3 hours
Model exam – 3 hours

Garment Construction Laboratory – III
List of equipment required for a batch of 30 students

S. No.	Name of the equipment / software	Quantity Required
1.	Single needle lock stitch machine	30
2.	Flat lock machine	1
3.	Feed off arm machine	1
4.	Over lock machine	2
5.	Button hole and button stitch machine	1 each
6.	Ironing Table	1
7.	Steam Iron	3
Total		**40**

U15FT606 IN-PLANT TRAINING 0 0 0 1

COURSE OBJECTIVES

At the end of this course, the students are 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 –VI	U15GE601B :SOFT SKILLS AND APTITUDE -IV	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 job-oriented company selection processes using the hands-on approach

2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests

3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in placement specific internal tests

1. Soft Skills	**Demonstrating Soft -Skills capabilities in the following areas:** a. Mock group discussions b. Mock interviews c. Mock stress interviews
2. Quantitative Aptitude and Logical Reasoning	**Solving problems in the following areas:** a. Progressions b. Heights and Distances c. Simple Interest d. Compound Interest e. Calendars f. Area and Perimeter g. Volume and Surface Area h. Boats and Streams i. Data Interpretation j. Puzzles k. Artificial Language l. Mathematical Operators m. Statement and Conclusion n. Data Sufficiency o. Geometry p. Company specific aptitude questions
3. Verbal Aptitude	**Demonstrating English language skills in the following topics:** a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Story a story for given pictures g. Company specific aptitude questions

OPEN ELECTIVE SYLLABUS

U15CE1001 Building Services and Safety Regulations 3 0 0 3 100

COURSE OBJECTIVES

To enable students to,

1. Describe the basics of electrical systems in buildings
2. Explain the principles of illumination and design of these systems
3. Describe the basics of thermodynamics, refrigeration principles and air conditioning systems
4. Discuss the fire safety regulations and installation of fire safety equipments and systems
5. Explain the water supply and sewerage systems for buildings

Unit I Electrical Systems in Buildings 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

Unit II Principles of Illumination & Design 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

Unit III Refrigeration Principles & Applications 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

Unit IV Fire Safety Regulations and Installation 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

Unit V Water Supply and Sewerage System for Buildings 9

Plumbing fixtures and fixture fittings – Water conserving fittings – Over flows – Strainers and connectors – Prohibited fixtures – Special fixtures – Installation of water closet – Urinals - Flushing devices – Floor drains – Shower stall – Bath tub – Bidets – Minimum plumbing facilities – Rain water harvesting systems – Necessity – Construction – Different types

Total: 45 Hours

TEXT BOOKS

1. David V. Chadderton **Building Services Engineering** Taylor & Francis, 2000
2. John Knight , W.P.Jones "Newnes Building services" Routledge 2003

REFERENCES

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 2009
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2011
3. Philips Lighting in Architectural Design, McGraw-Hill, New York, Latest edition
4. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1972
5. William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London , 1988
6. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 2007
7. National Building Code
8. Uniform Plumbing Code (India)

U15CE1002 Energy Efficiency and Green Building 3 0 0 3

COURSE OBJECTIVES

To enable students to,

1. describe concepts of energy efficient and green buildings
2. explain the energy efficient buildings.
3. describe construction materials and practices of energy efficient buildings.
4. explain building assessment .
5. elaborate discussion of clean devlopement mechanism.

Unit – I Introduction 9

Definition and concepts, Energy and water as a resource - criticality of resources - needs of modern living - Heat loss and heat gain in buildings- thermal comfort improvement methods - other building comforts -indoor air quality requirements -electrical energy conservation.

Unit – II Energy Efficient Buildings 9

Zero Energy Building (ZEB) - Nearly Zero Energy Building (NZEB) - energy consumption - defining low energy buildings- opportunities and techniques for energy conservation in buildings – water conservation - water management system - water efficient landscaping - green roofing - rainwater harvesting - sanitary fixtures and plumbing systems - wastewater treatment and reuse - process water strategies - adoption to sustainable resources, process and technologies- Energy Conservation Opportunities in Public and Private Buildings.

Unit – III Construction Materials and Practices 9

Construction materials – Embodied energy, carbon content, and emission of CO_2 ,SO_2 and NO_x of building materials, elements and construction process- Current practice and low environmental impact alternatives.

Unit– IV Building Assessment Schemes 9

Energy Efficiency Ratings & ECBC – 2007 – Various Energy Efficiency Rating Systems for Buildings – LEED, BEE, & GRIHA – case studies.

Unit – V Clean Development Mechanism 9

Clean Development Mechanism - CDM Benefits for Energy Conservation Methodology and Procedure – Eligibility Criteria – UNFCCC - role of UNFCCC and Government of India.

Total : 45 Hours

Text Books:

- KILBERT, Charles , (2008) Sustainable construction : Green Building Design and Delivery John Wiley and Sons.
- BROWN, G.Z. and DEKAY, Mark, 2001. Sun, Wind & Light – Architectural Design Strategies, Second Edition , John Wiley & sons, Inc.

References:

- ECBC Code 2007 (Edition 2008) published by Bureau of Energy Efficiency, New Delhi
- Bureau of Energy Efficiency Publications – rating System, TERI PUBLICATIONS .
- GRIHA Rating System, LEED Publications.

U15CE1003 Natural Disaster Mitigation and Management 3 0 0 3

COURSE OBJECTIVES

To enable students to,

1. Describe the disaster principles
2. Explain the utilization of resources and cost analysis techniques
3. Analyze the design of disaster resistant structures and Reconstruction after disasters
4. Relate the use of space science in disaster management
5. Explain Pre-disaster and post disaster planning for relief operations

Unit I Disaster Principles 9

Basic concepts and principles – Hydrological and geological disasters, characteristics, crisis and consequences – Role of Government administration, University research organization and NGO's – International disaster assistance – Sharing technology and technical expertise.

Unit II Long Term Mitigation Measures 9

Needs and approach towards prevention – Principles and components of mitigation Disaster legislation and policy – Insurance – Cost effective analysis – Utilisation of resources – Training – Education – Public awareness – Roles of media.

Unit III Safety Rating of Structures 9

Slope stability of GHAT roads –Structural safety of Dams, Bridges, Hospitals, Industrial structures, – Disaster resistant structures – Low cost housing for disaster prone areas – Cyclone shelter projects and their implications – Reconstruction after disasters: Issues of practices.

Unit IV Space Science Input in Disaster Management 9

Remote sensing in Hazard evaluation – Zonation – Risk assessment – Damage assessment – Land use planning and regulation for sustainable development – Communication satellite application- Network- Use of Internet – Warning system – Post disaster review – Case studies.

Unit V Emergency Planning Using Spatial and Non Spatial Data 9

Information systems management – Spatial and non-spatial data bank creation – Operational emergency management – Vulnerability analysis of infrastructure and settlements – Pre-disaster and post disaster planning for relief operations – Potential of GIS application in development planning – Disaster management plan – Case studies.

Total : 45 Hours

TEXT BOOKS

1. Bell, F.G. Geological Hazards: Their assessment, avoidance and mitigation. E &FN SPON Routledge, London. 1999
2. David Alexander, Natural Disasters, UCL Press, London, Research Press, New Delhi, 1993

REFERENCES

1. Nick Carter. W. Disaster Management – A Disaster Manager's Handbook. Asian Development Bank, Philippines. 1991
2. Mitigating Natural Disasters, Phenomena, Effects and options, A Manual for policy makers and planners, United Nations. New York, 1991
3. George G. Penelis and Andreas J. Kappos – Earthquake Resistant concrete Structures. E & FN SPAN, London, 1997

PREAMBLE

To

INDUSTRIAL ROBOTICS

Robotics is a multidisciplinary or interdisciplinary subject; it is a combination of branches like mechanical, Electrical, Electronics, Mechatronics, instrumentation, computer science and other branches also. Robotics deals with the design, construction, operation, and use of use of robots as well as computer systems for their control, sensory feedback and information processing.

Robot course bring the utilization of lot of sensors, motors, hydraulic and pneumatics system. Robot is a reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through variable programmed motions, for the performance of variety of tasks.

Those students who choose this course can design a robot for any engineering applications.

After completing the course the students will attain the following,

1. Explain the kinematics process of robotics system.
2. Working of different types grippers.
3. Working of various sensors.
4. Application of robot in different industries.
5. Write a programming and application of artificial intelligence.

The other department students will understand concepts related to linkages, degrees of freedom, forward and inverse kinematics which is useful for their research work, industry related jobs.

U15ME1002 INDUSTRIAL ROBOTICS 3 0 0 3

Pre-requisite subject: Kinematics of machinery, Dynamics of machinery, Mechatronics system design and Applied hydraulics and pneumatics systems.

Course Outcomes

Upon completion of this course the students will be able to

- Understand the kinematics process of robotics system.
- Study the working principle of different types of grippers.
- Study the working principle of various sensors.
- Study the industrial application of robots.
- Write the robot programming and application of artificial intelligence.

UNIT I INTRODUCTION AND ROBOT KINEMATICS 9

Definition need and scope of industrial robots – Robot anatomy – Work volume – Precision movement – Classification of robots. Robot Kinematics – Direct and inverse kinematics – Robot trajectories – Control of robot manipulators – Robot dynamics – Methods for orientation and location of objects.

UNIT II ROBOT DRIVES AND CONTROL 9

Controlling the robot motion – Position and velocity sensing devices – Design of drive systems – Hydraulic and pneumatic drives – Linear and rotary actuators and control valves –Electro hydraulic servo valves, electric drives – Motors – Designing of end effectors – Vacuum, magnetic and air operated grippers.

UNIT-III ROBOT SENSORS 9

Transducers and sensors – Sensors in robots – Tactile sensors – Proximity and range sensors – Sensing joint forces – Robotic vision system – Image Gribbing – Image processing and analysis – Image segmentation – Pattern recognition – Training of vision system.

UNIT-IV ROBOT CELL DESIGN AND APPLICATION 9

Robot work cell design and control – safety in robotics – Robot cell layouts – Multiple Robots and machine interference – Robot cycle time analysis. Industrial application of robots.

UNIT-V ROBOT PROGRAMMING, ARTIFICIAL INTELLIGENCE AND EXPORT SYSTEMS 9

Methods of robots programming – Characteristics of task level languages lead through programming methods – Motion interpolation. Artificial intelligence – Basics – Goals of artificial intelligence – AI techniques – Problem representation in AI – Problem reduction and solution techniques – Application of artificial intelligence in robots.

Total Number of hours: 45

Learning Resources

Text Books:

1. Yoram Koren, "Robotics for Engineers" Mc Graw-Hill, 1987.
2. Mikell, P.Groover, Mitchell Weis, Roger, N.Nagel, Nicholas G.Odrey, " Industrial robotics Technology, Programming and applications" Mc Graw-Hill 2012

Reference Books:

1. K.S.Fu, R.C.Gonzalez and C.S.G lee, "Robotics control, Sensing, Vision and Intelligence" Mc Graw-Hill, 2008.
2. Kozyrey, Yu. "Industrial Robotics", MIR Publishers Moscow 1985.
3. Richard D, Klafter, Thomas A, Chmielewski, Micheal Negin, "Robotics Engineering – An integrated Approach", Prentice-Hall of India Pvt Ltd 1984.
4. Deb S.R, "Robotics Technology and Flexible Automation", Tata Mc Graw-Hill, 1994
5. Timothy Jordanides et al, "Expert Systems and Robotics", Springer-Verlag, New York may 1991.

PREAMBLE
to
INDUSTRIAL SAFETY

The Constitution of India provide detailed provisions for the rights of the citizens and also lays down the Directive Principles of State Policy which set an aim to which the activities of the state are to be guided.

These Directive Principles provide

a) For securing the health and strength of employees, men and women;
b) That the tender age of children are not abused;
c) That citizens are not forced by economic necessity to enter avocations unsuited to their age or strength;
d) Just and humane conditions of work and maternity relief are provided; and
e) That the Government shall take steps, by suitable legislation or in any other way, to
Secure the participation of employee in the management of undertakings, establishments or other organisations engaged in any industry.

Government of India firmly believes that without safe, clean environment as well as healthy working conditions, social justice and economic growth cannot be achieved and that safe and healthy working environment is recognized as a fundamental human right. Education, training, consultation and exchange of information and good practices are essential for prevention and promotion of such measures.

By choosing this elective the students will be able to know the importance of Industrial safety. And also they could understand about the industrial safety acts. They will be familiar with the following

1. The changing job patterns and working relationships.
2. The rise in self-employment.
3. sub-contracting.
4. outsourcing of work.

U15ME1003 INDUSTRIAL SAFETY 3 0 0 3

Pre-requisites subjects: Environmental Science and Engineering

Course Outcomes

Upon completion of this course the students will be able to

- Learn the industrial acts of safety engineering
- Analyze industrial environment hygiene and prevent from diseases for human.
- Estimate industrial accidents like firing, explosion and identify safety controls.
- Study of the people efficiency in their industrial working environment.
- Learn the importance of safety training and the role of safety training and awareness etc.,

Unit I BASICS OF SAFETY ENGINEERING & ACTS L 9 T 0

Evolution of modern safety concept – safety audit – Concept of an accident investigation and reporting – safety performance monitoring. Acts – factories act – 1948 – Statutory authorities – inspecting staff – Tamilnadu Factories Rules 1950 under Safety and health – environment act – 1986 – Air act 1981, water act 1974 – other acts. Safety in industries – General safety concepts, machine guarding, hazards in metal removing process, welding process, cold and hot working process.

Unit II OCCUPATIONAL HEALTH AND INDUSTRIAL HYGIENE L 9 T 0

(Basic concepts, related hazards and exposure limits)

Physical Hazards – Noise, heat, recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases. Biological and Ergonomical Hazards-Basic concepts. Occupational Health-Concept and spectrum of health – functional units and activities of occupational health services, preemployment and post-employment medical examinations – occupational related diseases, levels of prevention of diseases, notifiable occupational diseases. Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, Preliminary Hazard Analysis (PHA), human error analysis, hazard operability studies (HAZOP), safety warning systems.

Unit III FIRE ENGINEERING AND EXPLOSIVE CONTROL L 9 T 0

Fire properties of solid, liquid and gases – fire triangle – principles of fire extinguishing – active and passive fie protection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers – Principles of explosion – Explosion Protection – Electrical Safety. Electrical Hazards – Primary and Secondary hazards – concept of earthing – protection systems – fuses, circuit breakers and over load relays – first aid.

Unit IV ERGONOMICS L 9 T 0

Introduction to ergonomics: The focus of ergonomics, ergonomics and its areas of application in the work system, a brief history of ergonomics, attempts to humanize work, modern ergonomics, future directions for ergonomics. Anatomy, Posture and Body Mechanics: Some basic body mechanics, anatomy of the sprine and pelvis related to posture, posture stability and posture adaptation, low back pain, risk factors for musculoskeletal disorders in the workplace, behavioural aspects of posture, effectiveness and cost effectiveness. Anthropometry and its uses in ergonomics, principles of applied anthropometry in ergonomics. Applications of human factors engineering, man as a sensor, man as information processor, man as controller – Man vs Machine – concepts of bio mechanics.

Unit V SAFETY EDUCATION AND TRAINING L 9 T 0

Importance of training – identification of training needs – training methods – programmes, seminars, conferences, competitions – method of promoting safe practice – motivation – communication – role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

Total Number of hours: 45

Learning Resources

Text Books:

1. Krishnan N.V., "Safety Management in Industry", Jaico Publishing House, Bombay, 1997.
2. Hand book of "Occupational Safety and Health", National Safety Council, Chicago, 1982.

REFERENCE BOOKS

1. The factories Act 1948, Madras Book Agency, Chennai, 2000.
2. Guidelines for Hazard Evaluation Procedures, Centre for Chemical Process Safety, AICHE 1992.
3. Introduction to Ergonomics, R.S. Bridger, Taylor & Francis.
4. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986.

PREAMBLE
to
RENEWABLE ENERGY SOURCES

Energy is an important source of all technological developments as well as for all basic needs. The usage of renewable energy sources are the only way for sustainable development and future energy requirements. Renewable energy encourages the generation of electricity without any environmental impact and improves the economic growth of the country.

By choosing this elective the students will be able to know the importance of renewable energy sources for power generation. And also they could understand how the fossil fuels are made an impact on environmental issues. They will be familiar with the following

1. Concept of solar energy power production and solar photovoltaic cells and the application of solar PV system and Bio Mass power generation system.
2. Principle of conversion of wind energy in to electric energy
3. Working of geothermal and hydro power stations.
4. Principle of the conversion of tidal and wave energy in to electric energy

After completion of this subject students will know how the energy can be produced locally. This knowledge would provide an opportunity to install small capacity power generation units independently for their needs.

U15ME1005 RENEWABLE ENERGY SOURCES 3 0 0 3

COURSE OUTCOMES

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

1. Illustrate the power demand scenario in world level and impact of various renewable energy sources in satisfying power demand.
2. Explain the different components and the principle of operation and the application of solar PV system and Bio Mass power generation system.
3. Outline in the components and to find the suitability based on the performance of wind energy
4. Conversion system, geothermal and hydel power system.
5. Describe the components of tidal power generation scheme and wave energy scheme and to discuss the performance of two schemes.
6. Outline the various components and methods of Ocean Energy Conversion Systems.

UNIT – I INTRODUCTION 9

World energy use – reserves of energy resources – energy cycle of the earth – environmental aspects of energy Utilization – renewable energy resources and their importance.

UNIT – II SOLAR & BIO ENERGY 9

Introduction – extra-terrestrial solar radiation – radiation at ground level – collectors – solar cells – applications of solar energy – Biomass Energy – Introduction – Biomass Conversion – Biogas Production – Ethanol Production – Pyrolysis and Gasification – Direct Combustion – Applications.

UNIT – III WIND, GEO THERMAL AND HYDRO ENERGY SOURCES 9

Introduction – Wind Energy – Wind speed and power relation – Power extracted from wind – wind distribution and wind speed predictions – types of Wind power systems. Geothermal energy – types of geothermal energy sites, site selection, and geothermal power plants, Hydro energy – Feasibility of small, mini and micro hydro plants: scheme, layout and economics.

UNIT – IV TIDAL ENERGY **9**

Introduction – origin of tides – power generation schemes – Wave Energy – basic theory – wave power Devices.

UNIT – V OTHER RENEWABLE ENERGY SOURCES **9**

Introduction – Open and Closed OTEC cycles – Ocean Currents – Salinity Gradient Devices – Potential impacts of harnessing the different renewable energy resources.

Lecture: 45; Tutorial: 0; Total: 45

TEXT BOOKS:

1. Rai, G.D., "Non-Conventional Energy Sources", Khanna Publishers,2011.

2. Rao S. Paruklekar,"Energy Technology – Non Conventional,Renewable and Conventional", KhannaPublishers,1970

REFERENCES:

1. F.Kreith and J.F.Kreider, Principles of Solar Engineering, McGraw Hill, 1978.

2. T.N.Veziroglu, Alternative Energy Sources, Vol 5 and 6, McGraw Hill, 1978.

3. MukundR.Patel, "Wind and Solar Power Systems", CRC Press LLC. John Wiley and Sons, 1991.

PREAMBLE
TO
ENERGY CONSERVATION AND MANAGEMENT

Energy is one of the most important resources to sustain our lives. At present we still depend a lot on fossil fuels and other kinds of non-renewable energy. The extensive use of renewable energy including solar energy needs more time for technology development. In this situation Energy Conservation (EC) is the critical needs in any countries in the world.

Energy saving is important and effective at all levels of human organizations – in the whole world, as a nation, as companies or individuals. Energy Conservation reduces the energy costs and improves the profitability.

Energy costs are often treated as a fixed overhead by organisations. But, by taking the right approach to energy management it is possible to make considerable savings. Successful energy management must combine an effective strategy with the right practical interventions. Many organisations would like to save energy, but they need to make energy management an integral part of running the organisation to ensure success. Energy Management is very important for the management of factories/companies, and Energy Conservation is one of its major topics.

U15EE1002 ENERGY CONSERVATION AND MANAGEMENT 3 0 0 3

COURSE OUTCOMES

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

1. Assess role of energy in global economic development.
2. Explain methodology of energy audit and concept of instruments used.
3. Discuss various lamps and design energy efficient illumination schemes.
4. Apply energy conservation concepts in buildings.
5. Identify the energy conserving opportunities in utilities.

UNIT- I ENERGY SCENARIO AND BASICS 9

Classification of Energy – Purchasing Power Parity – Energy Security – Strategy to meet future energy requirements – Objectives and features for electricity act 2003 – Energy efficiency standards and labeling – Study of Global and Indian primary energy reserves – Study of energy scenario for India – Energy and environment – Global environmental issues – Types of Energy – Electrical and Thermal energy basics – Energy units and conversions.

UNIT- II ENERGY MANAGEMENT AND AUDIT 9

Definition and objectives of energy management and audit – Need for energy audit – Types of energy audit – Methodology for conducting detailed energy audit – ENCON opportunities and measures – Energy audit report. Energy costs – Benchmarking – Energy performance – Fuel and Energy substitution – Instruments and metering for energy audit – Basic principles, components of material and energy balance – Sankey diagram – Financial analysis terms – Payback period, ROI, NPV, IRR.

UNIT- III LIGHTING SYSTEMS 9

Introduction – Terms in Lighting and Illumination – Light sources - Lamp types – Arc Lamps, Vapour lamps – Incandescent lamp, Fluorescent lamp – Energy saving lamps – CFL, LED – Lighting design for interiors – Indoor and outdoor lighting schemes – Energy saving opportunities – Energy efficient lighting controls.

UNIT- IV ENERGY CONSERVATION IN BUILDINGS 9

Energy conservation building code (ECBC) – Compliance approaches – ECBC guidelines on Building envelope, HVAC system, Service hot water, Water pumps – Energy consumption in Escalators and Elevators – Building Energy Management Systems – Star ratings – Energy Efficiency Measures in AC and Lighting system.

UNIT- V ENERGY EFFICIENT OPPORTUNITIES IN UTILITIES 9

Introduction to Compressed air system components – Heat transfer loops in refrigeration systems – Standards and labelling of room air conditioners – Introduction to Fans, Blowers and Compressors – Types of pumps, Pump curves – Efficient operation of pumps – Components of cooling towers and its efficient operation - Introduction to DG set system.

Energy Efficiency and energy savings in Compressed Air System, HVAC system, Fans and Blowers, Pumping system, Cooling towers, and DG sets.

Lecture: 45; Tutorial: 0; Total: 45

TEXT BOOKS:

1. "General Aspects of Energy Management and Energy Audit", Bureau of Energy Efficiency, Fourth Edition, 2015.
2. "Energy Efficiency in Electrical Utilities", Bureau of Energy Efficiency, Fourth Edition, 2015.

REFERENCE BOOKS:

1. Chakrabarti A, "Energy Engineering and Management", PHI, 2011.
2. Murphy W R, McKay G, "Energy management", Elsevier, 2009.
3. Rajput R K, "Utilization of Electrical Power", Lakshmi Publications, 2006.

U15EC1001 CELLULAR AND MOBILE COMMUNICATION 3 0 0 3

PREAMBLE:

Wireless communication has become essential part in our day to day life. During recent years there has been significant improvement in the field of wireless communication technology and has rapidly evolved from first generation (1G) to fourth generation (4G). The rapid growth of cellular phones, which principle carry voice are now being widely used for communicating data and images. New systems are integrated with the internet applications and data services, telephony, multimedia communication, and many more features.

To understand this technology, it is important to know in detail, a number of concepts associated with cellular mobile communication. The course is related to infrastructure development for cell based wireless communication in the multiple user environments. The cell theory is necessary for deciding the size of the cell and its splitting to cover more population density. Systems evolved from providing voice (2G) to all-IP data service (4G), creating a need for researchers and engineers with knowledge about cellular radio systems and digital wireless communication techniques. This course will provide important knowledge to graduate students who wish to work in wireless communication. Also, the course supplements the departmental research in wireless communication.

	CELLULAR AND MOBILE COMMUNICATION	**L T P C** **3 0 0 3**

COURSE OUTCOMES

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

1. Provide an overview of various generation in cellular communication systems and the system design fundamentals of cellular concept.
2. Analyze the concept of an overview of equalization and diversity techniques.
3. Discuss and analyze the channel coding and speech coding.
4. Describe the various multiple access techniques for wireless communications.
5. Explain the wireless systems and standards in mobile communication.

UNIT I	**INTRODUCTION TO MODERN WIRELESS COMMUNICATION SYSTEMS AND CELLULAR CONCEPT** Introduction – Second Generation (2G) Cellular Networks – Third Generation (3G) Wireless Networks – Cellular Concept –Frequency Reuse – Channel Assignment – Handoff Strategies – Interference and System Capacity – Trunking and Grade of Service – Improving Coverage and Capacity in Cellular Systems.	**9**
UNIT II	**EQUALIZATION AND DIVERSITY** Introduction – Fundamentals of Equalization – Training a Generic Adaptive Equalizer – Equalizers in Communication Receiver – Survey of Equalization Techniques – Linear Equalizers – Non-Linear Equalization – Algorithms for Adaptive Equalization – Diversity Techniques – RAKE Receiver.	**9**
UNIT III	**CHANNEL CODING AND SPEECH CODING** Introduction – Characteristics of Speech Signals – Quantization Techniques – Frequency Domain Coding of Speech – Vocoders and their Types – Linear Predictive Coders – Selection of Speech Coders for Mobile Communication – GSM Codec.	**9**
UNIT IV	**MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATIONS** Introduction – Multiple Access Techniques – FDMA – TDMA – Spread Spectrum Multiple Access – SDMA – Comparison of Multiple Access Techniques – Capacity of Cellular Systems.	**9**
UNIT V	**WIRELESS SYSTEMS AND STANDARDS** AMPS and ETACS – United States Digital Cellular (IS-54 and IS 136) – Global System for Mobile (GSM) – CDMA Digital Cellular Standard (IS-95) – Reverse CDMA Channel – CT2 Standard for Cordless Telephones – Digital European Cordless Telephone (DECT).	**9**
	Total	**45**

TEXT BOOK	
1.	T.S Rapp port, *"Wireless Communications" Principles and Practice*, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint, 2013.
REFERENCE BOOKS	
1.	R. Blake, *"Wireless Communication Technology"*, Thomson Delmar, 2003.
2.	W.C.Y.Lee, *"Mobile Communications Engineering: Theory and applications"*, Second Edition, McGraw-Hill International, 1998
3.	T.L.Singal, *"Wireless Communications"*, Tata McGraw Hill Education Private Ltd, 2011.

U15EC1002 EMBEDDED SYSTEMS 3 0 0 3

PREAMBLE:

Embedded System is an emerging technology that monitors and controls everything from Spacecraft to Robots, Microwave ovens, Car engines, video recorder, Television sets and much more. They control virtually everything that is electronic in our lives. Embedded systems are normally built around Microcontrollers, Digital Signal Processors (DSPs) and FPGAs or SOCs.

A lot of trained manpower is required in programming of these tools rather than in hardware design. Due to the shortage of skilled human resources in this area, embedded system engineers are most sought-after professionals and their salaries are skyrocketing.

Emergence of Embedded operating systems such as Embedded Linux and Android as well as Real-time operating systems helped in developing many exciting applications in embedded products which were unimaginable till recently. Real-time application with big potential in defense sector is another demand area in embedded domain.

	EMBEDDED SYSTEMS	L T P C 3 0 0 3
COURSE OUTCOMES **At the end of each unit, the students will be able to -**		
1. Obtain a broad knowledge on hardware and software architectures of an embedded system.		
2. Get the various design process and parameter analysis of the embedded system.		
3. Gain the familiarity on PIC microcontroller.		
4. Provide an in depth exposure on real time operating system.		
5. Design the software and hardware architecture of real time applications.		
UNIT I	**ARCHITECTURE OF EMBEDDED SYSTEMS** Introduction – Application Areas – Categories of Embedded System – Specialties of Embedded System – Recent Trends in Embedded System – Overview of Embedded System Architecture – Hardware Architecture – Software Architecture – Communication Software –Process of Generation of Executable Image – Development-Testing.	**9**
UNIT II	**DESIGN ANALYSIS OF EMBEDDED SYSTEMS** Embedded System Design Process – Formalism for System Design – Memory System Mechanism – CPU Performance – CPU Power Consumption – CPU Buses – Memory Devices – I/O Devices – Program Design – Model of Programs – Analysis and Optimization of Execution Time – Power – Energy – Program Size – Program Validation and Testing.	**9**
UNIT III	**PIC MICROCONTROLLER** PIC 16C61 / 71 Microcontroller Architecture – FSR – Reset Action – Oscillatory Connections – Memory Organizations – Instructions – Addressing Modes – I/O Ports-Interrupts – Timers – ADC.	**9**
UNIT IV	**REAL-TIME OPERATING SYSTEM CONCEPTS** Architecture of the Kernel – Task and Task Scheduler – Interrupt Service Routines – Semaphores – Mutex – Mailboxes – Message – Queues – Event Registers – Pipes – Signals – Timers – Memory Management – Priority Inversion Problem.	**9**
UNIT V	**REAL-TIME OPERATING SYSTEM TOOLS AND CASE STUDIES** Case Study of an Automatic Chocolate Vending Machine using MUCOS RTOS – Case Study of an Embedded System for Set-top Boxes – Case Study of an Embedded System for a PDA.	**9**
	Total	**45**

TEXT BOOKS	
1.	Marilyn Wolf, *"Computers as Components - Principles of Embedded Computer System Design"*, Morgan Kaufmann Publisher, (An Imprint from Elsevier), 3rd Edition 2012.
2.	K.V.K.K.Prasad, *"Embedded Real-Time Systems: Concepts, Design & Programming"*, Dreamtech press, 2005.
3.	Raj Kamal *"Embedded Systems Architecture Programming and Design"* 2nd Edition TMH, 2010.
4.	John B Peatman, *"Design with PIC Microcontrollers"*, Pearson Education Asis, 2002.
REFERENCE BOOKS	
1.	Ajay V Deshmukh, *"Microcontrollers Theory and Applications"*, 1st Edition, Tata McGraw Hill education, 2005.
2.	Shibu K V, *"Introduction to Embedded Systems"*, McGraw Hill, 2009.
3.	Jonathan W. Valvano, *"Embedded Microcomputer Systems-Real time interfacing"*, 3rd Edition, Cengage Learning, 2012.

U15EC1003 SATELLITE COMMUNICATION 3 0 0 3

PREAMBLE:

Satellite communication has become indispensable part of community. Its diverse applications like Television, DTH Broadcasting and mobile communication are wide spread through out the country. An important initiative towards societal development is made possible with satellite.

Study on the design of satellites and various segments like earth segment and space segment and the propulsion of the launch vehicles has been given profound importance.

Those students who would like to have some extra knowledge on communication and its background will be facilitated on learning this course

	SATELLITE COMMUNICATION	L T P C 3 0 0 3

COURSE OUTCOMES

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

6. Analyze the satellite orbits.
7. Analyze the space segment and budget equation
8. Analyse the earth segment and various test equipments
9. Analyse the various multiple access techniques.
10. Know the latest trends in satellite and its applications

UNIT I	**SATELLITE ORBITS** Kepler's Three Laws of Planetary Motion – Definition of Terms for Earth – Orbiting Satellites – Orbital Elements – Orbital Parameters – Orbital Perturbations – Station Keeping – Frequency Allocation – Non Geo-Stationary Orbits – Geostationary Orbits – Sun Transit Outages – Limits of Visibility – Look Angle Determination – Sub Satellite Point – Elevation Angle Calculation – Azimuth Angle Calculation – Launching of Geo Stationary Satellites – Launch Vehicles and Propulsion	**9**
UNIT II	**SPACE SEGMENT AND SATELLITE LINK DESIGN** Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem – Link Design – Satellite Up Link – Down Link – Link Power Budget– C/N0 – G/T– Noise Temperature – System Noise Propagation Factors – Rain and Ice Effects – Polarization.	**9**
UNIT III	**EARTH SEGMENT** Transmitters – Receivers – Antennas – Terrestrial Interface– TVRO – MATV – CATV – Test Equipments – Measurements on G/T – C/No – EIRP – Antenna Gain.	**9**
UNIT IV	**SATELLITE ACCESS** Modulation and Multiplexing – Voice- Data – Video – Analog – Digital Transmission System – Multiple Access –FDMA Systems – TDMA Systems – Beam Switching and Satellite Switched TDMA – CDMA.	**9**
UNIT V	**SATELLITE APPLICATIONS** Mangalyaan – Chandraayan Mobile satellite services – GSM – GPS – INMARSAT – LEO – MEO – Satellite Navigational System – Direct Broadcast satellites (DBS) – Direct to home Broadcast (DTH) – Digital audio broadcast (DAB) – World space services, Business TV(BTV) – GRAMSAT – DVB.	**9**
	Total	**45**

TEXT BOOK	
1.	Dennis Roddy, *"Satellite Communication"*, 4th Edition, McGraw Hill International, 2006.
REFERENCE BOOKS	
6.	S.Jayapoorani *"Satellite Communication*", Ist Edition, Scitech Publishers 2017.
7.	Timothy pratt , Bostian, C W, & Allnult, J, *"Satellite Communication*", latest edition , John Wiley publications,2003.
8.	Bruce R. Elbert, *"The Satellite Communication Applications"*, Hand Book, Artech House Bostan London, 1997.
9.	Robert Emanuel Fthenakis, *"Manual of Satellite Communications"*, McGraw Hill Book Co., 1984.
10.	Brian Ackroyd, *"World Satellite Communication and earth station Design*", BSP professional Books, 1990.

INTERNET OF THINGS 3 0 0 3

PREAMBLE

The “Internet of Things” (IoT) is the network of physical objects or "things" embedded with sensors, actuators, software, electronics and network connectivity to enable it to achieve greater value and service by exchanging data between the physical world and computer systems over existing network infrastructure. By connecting everyday real world objects such as transports, buildings and industrial equipments, IoT guarantees to revolutionize how we live and work. In the year 2020, it is estimated that approximately 30 billion devices will be connected in IoT. IoT will drive new consumer and business behavior that will demand increasingly intelligent industry solutions. It can also help various industries like agriculture, health services, energy, security, disaster management etc., which need to automate solutions to problems faced through remotely connected devices.

The Internet of Things involves three distinct stages:

1. The sensors which collect data (including identification and addressing the sensor/device)

2. An application which collects and analyzes this data for further consolidation

3. Decision making and the transmission of data to the decision-making server. Analytical engines, actuators and Big data may be used for the decision making process.

After completing the course the students will attain the following,

- Ability to build real time IoT applications by interfacing the sensors with minimal programming.
- Ability to associate sensor networks and communication modules for building IoT systems.

U15CS1001 INTERNET OF THINGS 3 0 0 3

COURSE OUTCOMES:

On Completion of the course, the students will be able to:

- Recall characteristics, physical and logical designs, domains.
- Differentiate IoT and M2M and explain IoT design methodology.
- Describe the various IoT components.
- Design a portable IoT system using Arduino/Raspberry Pi.
- Discuss the various applications of IoT.

UNIT I FUNDAMENTALS OF IOT 9

Introduction-Definition and Characteristics of IoT- Physical design- IoT Protocols-Logical design - IoT communication models, Iot Communication APIs- Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs.

UNIT II M2M AND IOT DESIGN METHODOLOGY 9

IoT and M2M- difference between IoT and M2M - Software defined networks, network function virtualization– Needs- IoT design methodology

UNIT III IOT COMPONENTS 9

Sensors and actuators - Communication modules - Zigbee- RFID-Wi-Fi-Power sources.

UNIT IV BUILDING IOT WITH HARDWARE PLATFORMS 9

Platform - Arduino/Raspberry Pi- Physical devices - Interfaces - Programming - APIs/Packages

UNIT V CASE STUDY 9

Various Real time applications of IoT- Home automation-Automatic lighting-Home intrusion detection- Cities-Smart parking-Environment-Weather monitoring system- Agriculture- Smart irrigation.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.

REFERENCES:

1. Manoel Carlos Ramon, – Intel Galileo and Intel Galileo Gen 2: API Features and Arduino Projects for Linux Programmers, Apress, 2014.

2. Marco Schwartz, – Internet of Things with the Arduino Yun, Packt Publishing, 2014.

3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley Publications, 2012.

4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key applications and Protocols", Wiley Publications 2nd edition , 2013.

U15CS1002 MOBILE APPLICATION DEVELOPMENT 3 0 0 3

COURSE OUTCOMES

At the end of this elective, student shall be able to:

1. Explain development framework and the need for mobile applications.
2. Create applications with layouts, framework.
3. Develop applications with intents and broadcast receivers.
4. Develop applications with database connectivity.
5. Develop applications to improvise user experience.

UNIT I INTRODUCTION 9

Android: An Open Platform for Mobile Development– Android SDK Features-Introducing the development framework - Standard development environment for Android applications – Creating Your First Android Application – Types of Android Application- Android Development Tools. Challenges of the mobile platform

UNIT II CREATING APPLICATIONS AND ACTIVITIES 9

Introducing the Application Manifest File- Using the Manifest Editor- Externalizing Resources- Android Application Lifecycle – Introducing the Android Application Class – Android Activities - Fundamental Android UI Design- Android User Interface Fundamentals- Introducing Layouts- Introducing Fragments, Creating New Views- Introducing Adapters

UNIT III INTENTS AND BROADCAST RECEIVERS 9

Introducing Intents- Creating Intent Filters and Broadcast Receivers- Using Internet Resources.

UNIT IV DATABASES AND CONTENT PROVIDERS 9

Shared Preferences – Working with the file systems - Introducing Android Databases- Introducing SQLite- Content Values and Cursors- Working with SQLite Databases- Creating Content Providers- Using Content Providers

UNIT V EXPANDING THE USER EXPERIENCE 9

Working in the background - Creating and Using Menus and Action Bar Action Items – Hardware Sensors - Telephony and SMS - Monetizing, Promoting, and Distributing Applications

Total: 45 hour

TEXT BOOK

3. Reto Meier, "Professional Android Application Development", Wiley, 2012

REFERENCE

1. http://developer.android.com/develop/index.html
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012

U15CS1003 OBJECT ORIENTED PROGRAMMING AND DATASTRUCTURES 3 0 03

PREAMBLE

Object-oriented programming (OOP) is a programming language model organized around objects rather than "actions" and data rather than logic. Historically, a program has been viewed as a logical procedure that takes input data, processes it, and produces output data.The programming challenge was seen as how to write the logic, not how to define the data. Object-oriented programming takes the view that what we really care about are the objects we want to manipulate rather than the logic required to manipulate them. Examples of objects range from human beings (described by name, address, and so forth) to buildings and floors (whose properties can be described and managed) down to the little widgets on a computer desktop (such as buttons and scroll bars).

Data Structure is a way of collecting and organising data in such a way that we can perform operations on these data in an effective way. Data Structures is about rendering data elements in terms of some relationship, for better organization and storage. The course is designed to prepare the students to have fundamental knowledge on data structures which is an essential skill to work in any IT industry. This course is designed for the students in non-circuit branches

COURSE OUTCOMES:

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

1. Understand the basic concepts of object oriented programming.
2. Design program for real time applications using inheritance and polymorphism.
3. Apply various linear tree data structures in real time applications.
4. Implement the operations of tree traversals and hashing techniques.
5. Develop and apply algorithms for real time applications using graphs

UNIT I PRINCIPLES OF OOP 9

Basic Concepts of Object Oriented Programming – Expressions – Control Structures, Functions - Classes and Objects, Class Members, Access Control, Pointers, Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation (new and delete).

UNIT II INHERITANCE AND POLYMORPHISM 9

Operator Overloading, Inheritance basics, types of inheritance, base class access control, compile time polymorphism, runtime polymorphism using virtual functions, abstract class, Exception Handling.

UNITIII DATA STRUCTURES **9**

Basic data structures, Abstract Data Type, Linear Data Structures- List ADT, Stack ADT, Queue ADT, Searching techniques-Linear Search, Binary Search, Sorting techniques -Insertion, Bubble and Merge sort.

UNIT IV TREES AND HASHING **9**

Basic terminologies, tree traversals, binary trees, binary search tree ADT, Hashing-Introduction –Hashing Techniques. Priority Queues -Binary heap.

UNIT V: GRAPHS **9**

Definitions, Topological sort, shortest path algorithm - Unweighted shortest path, Dijkstra's algorithm, Minimum Spanning Tree - Prim's algorithm, Kruskal's algorithm – Depth first search – Breadth first search.

Lecture: 45, Tutorial: 0, TOTAL: 45

TEXT BOOKS :

1. Mark Allen Weiss, "Data structures and Algorithms Analysis in C", 4th Edition, Prentice Hall, 2013.

2. E. Balagurusamy, "Object-Oriented Programming With C++", 3rd edition, Tata McGraw Hill, 2006.

REFERENCE BOOKS :

1. Adam Drozdek, "Data structures and algorithms in C++", 3rd Edition, Cengage Learning, 2013.

2. Langsam, Augenstein and Tanenbaum "Data structures using C and C++", 2nd Edition, Prentice Hall of India, 1998

3. Micheal T. Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", Wiley Student edition, John Wiley and Sons, 2009.

U15IT1001 BASIC DATA STRUCTURES 3 0 0 3

PREAMBLE

The goal of this course is to introduce the concepts of basic data structures and to familiarise with the implementation issues. The course is designed to prepare the students to have fundamental knowledge on data structures which is an essential skill to work in any IT industry. This course is designed for the students of non-circuit branches (Mechanical, Civil and Fashion Technology).

The students will acquire skills to represent real world data and store them in computational devices for further computations. The students will have hands-on experience in implementing the operations. Today, most of the applications are available in the digital format. The curiosity of knowing how the information is rendered digitally is answered in this course. For instance, the students will find the answer of how navigation is internally implemented by Google maps.

COURSE OUTCOMES

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

1. Explain and implement the operations on simple data structures such as lists
2. Explain and apply the stack data structure
3. Explain and apply the queue data structure
4. Explain and apply tree data structure and hash tables
5. Develop and apply algorithms for real applications using graphs

UNIT I LISTS 9

Mathematical analysis - Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – doubly-linked lists – circular linked list – Applications.

UNIT II STACK 9

STACK ADT – Array and Linked List Implementation of Stack – Stack Operations – Stack Applications: Balancing Symbols, Postfix Expression Evaluation, Infix to Postfix Conversion and Function calls.

UNIT III QUEUE 9

QUEUE ADT – Array and Linked List Implementation of Queues – Queue Operations – Circular Queues – Double ended Queues – Applications of Queues.

UNIT IV TREE STRUCTURES AND HASHING 9

Preliminaries-Implementation Tree ADT – tree traversals - Binary Tree ADT – expression trees – binary search tree – AVL trees – Hashing –General idea - Hash function - Separate chaining – open addressing –linear probing.

UNIT V GRAPHS 9

Definitions – Representation of graphs- traversals - breadth-first traversal - Depth-first traversal - shortest-path algorithms – Dijkstra’s algorithms- minimum spanning tree – Kruskal's algorithms.

Total: 45 hours

TEXT BOOK

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2006.

REFERENCES

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
2. R. F. Gilberg, B. A. Forouzan, “Data Structures”, Second Edition, Thomson India Edition, 2005.
3. A. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, “Data Structures using C”, Pearson Education, 1998.
4. Sara Baase and A. Van Gelder, “Computer Algorithms”, Third Edition, Pearson Education, 2000.
5. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to Algorithms", Second Edition, Prentice Hall of India Ltd, 2001.

U15IT1003 PROBLEM SOLVING TECHNIQUES USING JAVA PROGRAMMING 3 0 0 3

PREAMBLE

The students opting for this course will learn to code in Java and improve the programming and problem-solving skills. Through this course, the students will acquire appropriate skills to design algorithms as well as develop and debug programs. We are excited to offer a unique course structure, designed to support learners of different engineering departments and to fulfill their dreams of pursuing a career in an IT industry.

After the completion of the course, learners will be able to code real time problems in JAVA programming language.

COURSE OUTCOMES

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

6. Apply basic features of Java to write programs for solving problems
7. Apply event handling techniques for interaction of the user with GUI
8. Write programs to handle exceptions and I/O
9. Assign priorities and resolve run-time errors with multithreading concept
10. Connect Java applications with relational databases using JDBC for storing and retrieving sensitive data

UNIT I OBJECTS, CLASSES AND INHERITANCE 9

The History and Evolution of Java – An Overview of Java - Data Types –Variables - Arrays – Operators- Control Statement – Introducing Classes and Methods - Inheritance

UNIT II INTERFACE AND PACKAGE 9

Working with predefined and user defined packages - Access Protection – Importing Packages – Interfaces- Default Interface Methods – using static method in an interface

UNIT III EXCEPTION HANDLING AND I/O 9

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- I/O Basics – Reading and writing Files- Exploring java.io

UNIT IV GUI AND EVENT HANDLING 9

The Applet Class - Two type of Applet – Applet Architecture – Applet Programming – Event Handling – Two Event Handling Mechanism – The Delegation Event Model – Event Classes – The Key Event Classes – Source of Events – Adapter Classes – Inner Classes – AWT controls

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 – Resultset.

Total: 45 hours

TEXT BOOK

1. Herbert Schildt, "Java™ : The Complete Reference", Ninth Edition, Tata McGraw Hill, 2014.

REFERENCES

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

U15IT1004 PYTHON PROGRAMMING 3 0 0 3

PREAMBLE

Python is an easy to learn, powerful programming language. It has efficient high-level data structures. It is a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms. This programming language has become a preferred development technology in IT industries.

Python can be integrated with many other technologies also. It is rapidly becoming a de-facto language for data analytics and / or machine learning as many packages are added to perform more complex tasks. This course aims to teach everyone the basics of programming using Python.

COURSE OUTCOMES

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

1. Write simple applications
2. Develop programs using loops
3. Create applications using functions
4. Develop application using files
5. Create application using Python and MySQL

UNIT I INTRODUCTION 9

The way of programming-What is programming- debugging – formal and natural languages - Python: Features - Installing - Running – The Basics-variables-Operators and Expressions

UNIT II CONTROL FLOW 9

Control Flow: introduction- if – else – while statement – do while – for loop –break – continue

UNIT III PYTHON FUNCTIONS 9

Sequences: String - List – Tuple – Dictionary - Functions – Function Parameters, Local and Global Variables, Default Arguments, Keyword Arguments, Return Statements.

UNIT IV PYTHON MODULES, PACKAGES AND FILES 9

Introduction – Byte files – from import – making own modules – Files and Input/Output: File Objects and Built in functions – Command line Arguments – Packages.

UNIT V PYTHON DATABASE CONNECTIVITY 9

SQL Introduction – simple queries – create - insert – update – delete, MySQL Introduction – connecting python and MySQL database.

Total: 45 hours

TEXT BOOK

1. Swaroop C N, " A Byte of Python ", ebshelf Inc., 1st Edition, 2013.

REFERENCES

1. Wesley J. Chun, "Core Python Programming", Pearson, 2nd Edition, 2006.

2. Allen B.Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly Media, 2nd Edition, 2015.

U15FT1001 FUNDAMENTALS OF FASHION DESIGN 3 0 0 3

PREAMBLE

Fashion is a popular style or practice, especially in clothing, footwear, accessories, makeup, body, or furniture. Fashion is a distinctive and often constant trend in the style in which a person dresses. It is the prevailing styles in behavior and the newest creations of textile designers. Because the more technical term *costume* is regularly linked to the term "fashion". **Fashion** means something that is trendy or valued in a certain time period. The prevailing fashion/ trends/style is called 'vogue'.

1. Personality: we show our personality through our personal style.
2. Fun: it can be fun to follow the fashions and debate them.
3. Industry: the fashion industry is a very profitable one.

A wardrobe planning is a strategy, game plan or a formula for meeting the clothing needs. It can be simple or complicated but it should be designed in such a way to meet our personal needs. Fashion entrepreneurs focus on creating networks including education, profitability and profile-building. Some fashion entrepreneurs work to provide a network of knowledge share platforms, other work to address social and structural issues goals

Those students who would like to have some extra earnings by the way of designing making and selling fashion accessories like earrings, bracelets and anklets etc.. need to have a basic knowledge on fashion. This subject guides them accordingly,

After completing the course the students will attain the following,

Ability to develop a style that is distinctive, consistent and new

Ability to manage the process of communication on which fashion depends

COURSE OBJECTIVE

To enable students to define and discuss the terms related to fashion, the classification, understanding and selection of clothing, to grasp the elements of design and principles of design and the portfolio presentation.

COURSE OUTCOMES

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

1. Define and discuss the fashion and related terms and reason for change in fashion and the classification
2. Describe clothing and its purpose, Role of clothing and its status.
3. Describe the selection of clothing for various age groups, Fashion apparel and wardrobe planning.

4. Explain the elements and principles of the design, with the effects in the apparel
5. Bounce out the theme and development of portfolio.

Unit – I **9**

Introduction to Fashion

Origin of fashion - terms and definitions - reasons for change in fashion - classification of fashion – Style, Classic, FAD, Trend – theories of fashion – movement of fashion - fashion cycle.

Unit 2 **9**

Introduction to Clothing

Understanding clothing - Purpose of clothing: protection, modesty, attraction etc - Importance of clothing - Clothing Culture, Men and Women clothing and ornamentation - Role and status of clothing - Clothing according to climatic conditions – factors to be considered in the selection of clothing

Unit – 3 **9**

Selection of clothes

Clothes for children, middle-aged and adults. Types of clothes according to different types of human figure, Different materials for different clothes, Fabrics and colours suitable for different garments.

Planning for clothing needs: Formal clothing, Clothes for parties, Clothes for sports, Casual Clothes for casualwear.

Wardrobe Planning: Wardrobe for men and women

Unit – 4 **9**

Elements of Design: Introduction on basics Elements of design - Silhouette, Details, Texture, Color, Lines,

Principle of design: Introduction to principles of Elements of design - Proportion, Balance, Rhythm, Center of Interest, Harmony

Unit 5 **9**

Design and Development

Designer boards - Mood board, fabric board, colour board, accessory board. Fashion illustration – head theories, Illustration techniques – strokes, hatching, shading; Colouring techniques – Medias for colouring. Portfolio presentation – styles of presentation - Fashion shows.

TOTAL: 45 hours

TEXT BOOKS

1. Munslow, Janine, McKelvey, Kathryn “Fashion Design Process Innovation and Practice”, 2nd Edition , wiley , 2012.
2. Nicola White, Ian Griffiths, “The Fashion Business Theory, Practice, Image”, Berg, 2000.

REFERENCES:

1. Sumathi, G.J. **"Elements of Fashion and Apparel Design"** New Age International Publishers, New Delhi.

2. Kathryn McKelvey **"Fashion Source Book"** Balckwell Publishing New Delhi.

3. Jane Mills and Janet K.Smith "**Design Concepts**" Fairchild Publications, New York.

4. Judith Rasband „**Wardrobe strategies for women", ,** Delmar publishers, London.

5. Jeannette A.Jarnow, Mirianr Guerreiro & Beatrice Judelle**, "Inside the fashion business"** 4th edition Mac Millan Publishing Company, NewYork.

U15FT1002- Ornamentation Techniques for Value Addition of Apparel 3 0 0 3

PREAMBLE

At the end of the study of this course the students will be able to, explain the fundamentals of hand and machine embroidery stitches. Samples will be developed by practicing different types of hand embroidery, Indian traditional embroidery, specialized hand embroidery and different printing methods. These can be used on different types of fabrics and can be implemented in various types of garments such as kids, women and men garments. They will also gain knowledge on the procedure of how costing is done for different value additions. Instructions on care and maintenance of the finished products is also given

COURSE OBJECTIVE

To enable the students to impart knowledge on various value addition techniques such as hand, machine and specialized embroidery along with the costing and maintenance care of the same.

COURSE OUTCOMES

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

1. Explain the fundamentals of hand and machine embroidery
2. Describe the procedure and types of stitching hand embroidery stitches. Also develop the sample.
3. Describe the procedure for doing traditional embroidery and develop the sample.
4. Describe the procedure of making specialised hand embroidery and printing. Also develop the sample.
5. Derive the cost for the finished embroidery material and also describe the maintenance care for finished embroidery sample

UNIT I Introduction to embroidery 9

Hand Embroidery: Introduction, Origin of embroidery, General rules for hand embroidery, Tracing of Embroidery design, Precautions to be taken for proper maintenance of embroidery articles. - Selection of needle, Threads and fabrics for hand Embroidery

UNIT II Hand embroidery stitches 9

Hand embroidery stitches: Knowledge, Classification and practice of - Running, Couching, Button hole, Satin, Long and short, Wheat, Chain, Stem, Herringbone, Cross stitch, Knotted stitches, Fish bone.

UNIT III Traditional embroidery 9

Indian traditional embroideries: The type of stitches, Designs, Colours and materials used for Phulkari, Kasuti, Kashmiri embroidery, Kutch work, Chikkankari, Kantha,

UNIT IV Specialised Surface Ornamentation 9

Specialised embroidery: Knowledge and practice of surface ornamentations - Eyelet work, Cutwork, Richelieu work, Lace work, Drawn thread and fabric work, Patch work, Mirror work, Appliqué, Shaded embroidery, Zardosi work, Shadow work, Stone (Kundan) work, Badla work, Bead and sequins work, Bobbin-thread embroidery

Printing: Batik, Kalamkari, Tie and Dye

UNIT V Costing and maintenance of embroidery articles 9

Selection of thread color and suitable stitches for embroidery using computer –Care and maintenance of embroidery articles – pressing embroidery articles – frames & backing materials Types & Purposes. Estimating, costing & marketing of finished embroidery goods.

TOTAL: 45 hours

TEXT BOOKS

1. Sheila Paine, **Embroidered Textiles**, Thames and Hudson Ltd., London, 1990.
2. Gail Lawther, **Inspirational Ideas for Embroidery on Clothes and Accessories**, Search Press United Kingdom, 1993.

REFERENCES:

1. Shailaja D. Naik, "Traditional Embroideries of India", A.P.H Publishing Corporation, New Delhi,1996.
2. Gini Stephens Frings, "Fashion - From Concept to Consumer", Prentice Hall, New Jersey,1999.
3. Sheila Paine, "Embroidered Textiles", Thames and Hudson Ltd., 1990.
4. Gail Lawther, "Inspirational Ideas for Embroidery on Clothes and Accessories", Search Press

Ltd., 1993.

5. Training Manual for Embroidery Machine Operators, TAJIMA, UIET, Tirupur, 2003.
6. Training Manual for Embroidery Machines, Barudan, Tirupur, 2002.