Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Civil Engineering
Branch: Structural Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19STR201	Advanced Design of Concrete Structures	3	0	0	3
2	P19STR202	Advanced Design of Steel Structures	3	0	0	3
3	P19STR501	**Elective -** Prefabricated Structures	3	0	0	3
4	P19STR514	**Elective -** Formwork Engineering	3	0	0	3
5	P19GE702	**Audit Course**: Stress Management by Yoga	2	0	0	0
Practical						
6	P19STR203	Structural Software Application Laboratory	1	0	4	3
7	P19STR204	Mini Project	0	0	4	2
					Total Credits	**17**

Approved by

Chairperson, Civil Engineering BOS
Dr.R.Malathy

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/Civil, Second Semester ME STR Students and Staff, COE

P19STR201	Advanced Design of Concrete Structures	3 0 0 3

COURSE OUTCOMES

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

CO1. Describe the design philosophy of Concrete Structures
CO2. Design the columns, walls, corbels, deep beams and grid floors
CO3. Design the flat slabs by yield line approach
CO4. Discuss the inelastic behaviour of concrete beams and columns
CO5. Deliberate the detailing for ductility of beams, columns and frames

UNIT-I: INTRODUCTION **9 Hrs.**

Calculation of deflection and crack width according to IS Code. Construction of Interaction curve for compression member with axial force and bending – Design of slender column. Behaviour of beams for flexure, shear and torsion.

UNIT –II: DESIGN OF SPECIAL REINFORCED CONCRETE ELEMENTS **9 Hrs.**

Design of Reinforced Concrete walls, Design of shear wall, – Strut and tie method of analysis for corbels and deep beams, Design of corbels, deep beams and grid floors.

UNIT –III: FLAT SLABS AND YIELD LINE APPROACH **9 Hrs.**

Design of flat slabs according to IS method - Design of spandrel beams - Yield line analysis and design of square, rectangular, triangular and circular slabs with various boundary conditions. Hillerborg's strip method.

UNIT –IV: INELASTIC BEHAVIOUR OF CONCRETE BEAMS AND COLUMNS **9 Hrs.**

Inelastic behaviour of concrete beams by Baker's method, moment – rotation - curvature characteristics. Limit analysis – Conditions for moment redistribution - Stress-Strain behaviour of confined and unconfined columns.

UNIT –V: DUCTILE DETAILING **9 Hrs.**

Concept of Ductility – Design and detailing of beams, columns for ductility - Design of cast-in-situ joints in frames – Determination of ductility factor for singly and doubly reinforced beams.

Total: 45 hrs.

REFERENCE BOOKS:

1. Gambhir.M. L., "Design of Reinforced Concrete Structures", Prentice Hall of India, 2012.
2. Purushothaman, P, "Reinforced Concrete Structural Elements: Behaviour Analysis and Design", Tata McGraw Hill, 1984
3. Unnikrishna Pillai and Devdas Menon "Reinforced Concrete Design', Third Edition, Tata McGraw Hill Publishers Company Ltd., New Delhi, 2009.
4. Varghese, P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India, 2005.
5. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, 2007.

P19STR202	Advanced Design of Steel Structures	3 0 0 3

COURSE OUTCOMES

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

CO1. Explain and design the different types of steel connections
CO2. Analysis and design various components of industrial structures.
CO3. Design the steel members subjected to combined forces.
CO4. Design steel chimney subjected to wind loads.
CO5. Evaluate the behaviour and design of light gauge elements.

UNIT-I: DESIGN OF CONNECTIONS **9 Hrs.**

Introduction- Classification of connections. Bolted and Welded connections: Basic concepts- Beam-to-Beam connections. Beam-Column connection: Unstiffened and Stiffened seated Connections-Moment Resistant Connections.

UNIT –II: ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS **9 Hrs.**

Industrial building-Planning-Structural framing-Elements of industrial building- Analysis and design of trusses-Design of Purlins, Gable column and Gable wind girder-Introduction to pre-engineered building. Design and detailing for earthquake and wind loads. Design consideration for durability.

UNIT –III: DESIGN OF COMBAINED FORCES **9 Hrs.**

Design of members subjected to combined forces: Beam-Column-Crane Gantry Girders –Design of simple bases, Gusseted bases and Moment Resisting Base Plates

UNIT –IV: DESIGN OF STEEL CHIMNEY **9 Hrs.**

Introduction to chimneys -Types-Dimensions of steel stacks-Components: Lining- Breech openings and access ladder-Loading and load combinations-Design considerations-Design of self supporting and guyed steel chimney.

UNIT –V: DESIGN OF LIGHT GAUGE STEEL STRUCTURES **9 Hrs.**

Light gauge steel section: Introduction-Applications-Advantages-Behaviour-Forms-Edge and Intermediate stiffener-Stiffened, unstiffened and multiple stiffened element-Flat-width ratio-Effective width for load and deflection determination-Analysis and design of compression and flexural members.

Total: 45 hrs.

REFERENCE BOOKS:

1. Subramanian N, “Design of Steel Structures”, Oxford University Press, New Delhi 2011.
2. Duggal S.K, “Design of Steel Structures”, Tata McGraw-Hill Education, 2009.
3. Shiyekar M.R, “Limit State Design in Structural Steel”, Prentice Hall of India Pvt. Ltd, 2017.
4. Punmia B.C., Comprehensive Design of Steel Structures, Lakshmi Publications, New Delhi, 2000.
5. Teaching Resource on Structural steel Design, INSDAG, Ministry of Steel Publishing, 2000.
6. Bhavikatti.S.S, “Deign of Steel structures”, I.K. International publishing house, New Delhi, 2009.

P19STR203	Structural Software Application Laboratory	1 0 4 3

COURSE OUTCOMES

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

CO1. Analysis and design of steel roof trusses by softwares

CO2. Analysis and design of Reinforced Concrete frames by softwares

CO3. Analysis of various members by Finite Element Analysis softwares

Contents **45 Hrs.**

1. Analysis and design of 2D and 3D Steel roof trusses for static, wind and seismic forces.
2. Analysis and design of 2D and 3D Reinforced Concrete rigid frames for static, wind and seismic forces.
3. Finite Element modeling, analysis and design of Reinforced Concrete and Steel Elements.

Total: 45 hrs.

References:-

1. Laboratory manuals prepared by Civil Engineering Department, Sona College of Technology, Salem.
2. Unnikrishna Pillai and Devdas Menon "Reinforced Concrete Design', Third Edition, Tata McGraw Hill Publishers Company Ltd., New Delhi, 2009.
3. Subramanian N, "Design of Steel Structures", Oxford University Press, New Delhi 2011
4. Prof. S.K. Bhattacharyya and Dr. D. Maity "Finite Element Analysis" NPTEL Web course, IIT Kharagpur.

P19STR204	Mini Project	0 0 4 2

COURSE OUTCOMES

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

CO1. Identify structural engineering problems reviewing available literature.

CO2. Study different techniques used to analyze complex structural systems.

CO3. Work on the solutions given and present solution by using his/her technique applying engineering principles.

Syllabus Contents: **30 Hrs.**

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Semester and End Semester will be monitored by the departmental committee.

Total: 30 hrs.

P19STR501	PREFABRICATED STRUCTURES	3 0 0 3

COURSE OUTCOMES

Upon completion of this course, the student will be able to…

CO1 Explain the principles and concepts of Prefabricated Structures.
CO2 Describe prefabricated elements along with their structural connections.
CO3 Summarize the production techniques of prefabricated elements.
CO4 Elucidate the hoisting techniques adopted in prefabrication construction.
CO5 Discuss the applications of prefabrication in construction field.

UNIT-I: GENERAL PRINCIPLES OF FABRICATION **9 Hrs.**

Comparison with monolithic construction – Types of prefabrication – site and plant prefabrication - Economy of prefabrication – Modular coordination – Standardization– Disuniting of structures –Handling and erection stresses.

UNIT–II: PREFABRICATED ELEMENTS **9 Hrs.**

Roof and floor panels – wall panels – shear walls - columns – Joints for different structural connections – Effective sealing of joints for water proofing – Provisions for non-structural fastenings –Expansion joints in pre-cast construction

UNIT–III: PRODUCTION TECHNOLOGY **9 Hrs.**

Choice of production setup – Manufacturing methods – Stationary and mobile production – Planning of production setup – Storage of precast elements – Dimensional tolerances – Acceleration of concrete hardening.

UNIT–IV: HOISTING TECHNOLOGY **9 Hrs.**

Equipment for hoisting and erection – Elimination of erection stresses – Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns – Vacuum lifting pads – Lifting with external pre-stressing.

UNIT–V: APPLICATIONS **9 Hrs.**

Designing and detailing of precast unit for factory structures – Purlins, Principal rafters, roof trusses, lattice girders, gable frames – Single span single storeyed frames – Single storeyed buildings – slabs, beams and columns - water tanks

Total: 45 hrs.

REFERENCE BOOKS:

1. I. T. Koncz, Manual of Precast Concrete Construction, Vol. I, II, III & IV, Berlin, 1971
2. B. Lewicki, Building with Large Prefabricates, Elsevier Publishing Company, Amsterdam, London, New York, 1998
3. L. Mokk, Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.
4. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete, Netherland BetorVerlag, 2009
5.Kims S. Elliot, Precast Concrete Structures, CRC Press, Taylor & Francis, 2017
6. IS15916:2011, Building design and erection using prefabricated concrete. BIS, India, 2011.

P19STR514	Formwork Engineering	3 0 0 3

COURSE OUTCOMES

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

CO1 Describe the materials and behavior of formwork
CO2 Design of foundation, wall and column formwork
CO3 Design the formwork for beam, slab, bridges and special structures
CO4 Design of Flying Formwork slipform techniques
CO5 Design of formwork for supports – Scaffolds and precast concrete

UNIT-I: INTRODUCTION **9 Hrs.**

Introduction-Formwork as a temporary structure-requirements for Formwork-selection of Formwork-Classification of Formwork- Formwork Materials-Timber-Plywood-Steel-Aluminium Form-Plastic Forms-other Material-Form Coating and Mould Linings-Form Anchors-Tie System-Spreaders, Spacers-Form Linings Materials.

UNIT –II: FORMWORK DESIGN CONCEPTS & FOUNDATION FORMWORK **9 Hrs.**

Loads on Formwork-Dead or Permanent Loads-Imposed Loads-Environmental Loads-Design Basis (Assumption Made in Formwork Design)-Estimating Permissible Stress-Maximum Bending Moment, Shear Force, and Deflection-Formwork for Foundation-Conventional Formwork for Foundation-Foundation Formwork (All Steel)-Foundation Formwork Design-Illustration on Foundation Wall Design.

UNIT –III: WALL & COLUMN FORMWORK **9 Hrs.**

Wall Formwork - Conventional Wall Formwork-Proprietary Wall Formwork System - Large Area Wall Forms-Climbing Formwork Wall Formwork - Climbing Formwork - Different types of Climbing formwork – Doka climbing Formwork - Wall Form Design - Illustration of Wall Formwork Design Using Plywood and H-16 Beams - Column Formwork - Conventional Column Formwork - Proprietary Column Formwork - Column Formwork System - Doka form work system - PERI Column Formwork - Disposable Column Formwork - All Metal Column Formwork-Achieving Formwork Economy in Column Construction-Design For Column Formwork-Illustration of Column Formwork Design-Example.

UNIT –IV: SLAB AND BEAM FORMWORK **9 Hrs.**

Traditional Slab and Beam Formwork-Slab and Beam Formwork Solutions offered by L&T - Beam and Slab Formwork Solution by PERI and Mivan - achieving Economy In Slab Construction - Design of Slab and Beam Construction - Illustration of Slab and Beam Formwork Design - Illustration of Proprietary Slab Formworkb-Formwork Arrangement for Caissons - Formwork For Piers And Pier Caps-Bridge Superstructures - Formwork for Bridge Railing / Parapets / Edge Beams - Cases Temporary Support Structures of Bridges.

UNIT –V: FLYING FORMWORK **9 Hrs.**

Some Examples of Flying Formwork - Flying Formwork Cycle - Advantages and Limitation of Flying Formwork -Design Issues In Flying Forms - Safety Issues in Flying Forms - Table Forms - Tunnel Formwork System - Column Mounted Shoring System - Gang Forms – Slipform - Vertical Slipform - Horizontal Slipform -Types of Slipform - Functions of Varies Slipform Components - Assembly, Sliding and Dismantling of Slipform - Slipform Design Issues - Some Cases in Slipform - Safety Operation during Slipform Erection - Productivity Issues in Slipform Construction. Failure of formworks.

Total: 45 hrs.

REFERENCE BOOKS:

1. Kumar Neeraj Jha, "Formwork for concrete structures" Tata Mcgraw Hill Education Private Limited New Delhi – 2012
2. Peurifoy R.L., Oberlender G.D., " Formwork For Concrete Structures", McGraw Hill, New York, 1996

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Civil Engineering
Branch: Construction Engineering and Management

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19CEM201	Resource Management and Control in Construction	3	0	0	3
2	P19CEM202	Construction Laws and Regulations	3	0	0	3
3	P19CEM510	**Elective** - Project Safety Management	3	0	0	3
4	P19CEM511	**Elective** - Construction Equipment and Management	3	0	0	3
5	P19GE702	**Audit Course:** Stress Management by Yoga	2	0	0	0
Practical						
6	P19CEM203	Software Application Laboratory for Construction Management	1	0	4	3
7	P19CEM204	Mini Project	0	0	4	2
					Total Credits	**17**

Approved by

Chairperson, Civil Engineering BOS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.Malathy	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/Civil, Second Semester ME CEM Students and Staff, COE

P19CEM201	Resource Management and Control in Construction	L T P C 3 0 0 3

COURSE OUTCOMES

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

CO1 know the management and planning of various resources involved in construction.

CO2 describe the effect of resource planning.

CO3 illustrate the management of materials and equipment.

CO4 explain the effect of time management.

CO5identify the process of resource allocation and resource levelling in construction

UNIT-I: RESOURCE PLANNING **9 Hrs**

Resource Planning, Procurement, Identification, Personnel, Planning for material, Labour, time schedule and cost control, Types of resources, manpower, Equipment, Material, Money, Time.

UNIT –II: LABOUR MANAGEMENT **9 Hrs.**

Systems approach, Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour- Productivity analysis for labour.

UNIT –III: MATERIALS AND EQUIPMENT **9 Hrs.**

Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution.

Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.

UNIT –IV: TIME MANAGEMENT **9 Hrs.**

Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects – Cash flow and cost control-Fast track construction.

UNIT –V: RESOURCE ALLOCATION AND LEVELLING **9 Hrs.**

Time-cost trade off, Computer application – Resource levelling, resource list, resource allocation, Resource loading, Cumulative cost –Value Management.

Total: 45 hrs.

REFERENCE BOOKS:

1. Andrew, D. Szilagg, “Hand Book of Engineering Management”, 2002.
2. Glenn .A, Sea's and Reichard, Clough .H, “Construction Project Management”, John Wiley and Sons, Inc, 2009.
3. Harvey, A. Levine, “Project Management using Micro Computers”, Obsome McGraw Hill C.A. Publishing Co., Inc. 2008.
4. James, A., Adrain, “Quantitative Methods In Construction Management”, American Elsevier Publishing Co., Inc., 2003.

P19CEM202	Construction Laws and Regulations	L T P C 3 0 0 3

COURSE OUTCOMES

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

CO1 study the elements of concluding, and administering contracts

CO2 know about the concepts of tendering procedures.

CO3 achieve awareness on arbitrations and legal procedures

CO4 explain the different taxes involved in construction activities

CO5 gain knowledge on labour regulations and their impact on managing of contracts

UNIT-I: CONTRACT AGREEMENTS **9 Hrs**

Functions of Contracts in engineering- Introduction to Contract agreements, Terms involved in Contract agreements - Elements of Contracts -Types of Contracts – Standard Contract Document - Conditions of Contract-Law of Torts.

UNIT –II: TENDERING CONCEPTS **9 Hrs**

Tendering Process - tender documents – requirements for tendering –Methods of inviting tenders- Evaluation of Tender from Technical, financial aspects – Two Cover System- Preparation of the Documentation.

UNIT –III: APPOINTMENT OF ARBITRATOR **9 Hrs**

Earnest Money Deposit (EMD) – Security deposits - Arbitrator- appointment of arbitrator-power and duties of arbitrator – dispute review board- Violations – Certificates, Forms, and Schedules – Extension of time and extended stay-Case study.

UNIT –IV: TYPES OF TAX INVOLVED IN CONSTRUCTION **9 Hrs**

Potential Contractual Problems – price variation clause – fine and Liquidated Damages – insurance income tax – sales tax – VAT – Legal requirements of planning –Local government approval-Case study.

UNIT –V: LABOUR LAWS **9 Hrs**

Indian Contracts Act - Labour laws – workmen compensation act – minimum wages Act – Child labour Act- Industrial dispute Act- Maternity benefit Act – Domestic emerging on misconduct.

Total:45 hrs.

REFERENCE BOOKS:

1. John G. Betty., "Engineering Contracts", McGraw Hill, 2003.
2. Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", M. M. Tripathi Private Ltd., Bombay, 1982 Tamilnadu PWD Code, 2006.
3. Jimmie Hinze, "Construction Contracts", McGraw Hill, 2001 4. Joseph T. Bockrath, "Contracts, the Legal Environment for Engineers and Architects", McGraw Hill, 2000.
4. Joseph T. Bockrath, "Contracts, the Legal Environment for Engineers and Architects", McGraw Hill, 2000.

P19CEM203	Software Application Laboratory for Construction Management	L T P C 1 0 4 3

COURSE OUTCOMES

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

CO1Prepare quantity takeoff and delivery of bid for construction projects.

CO2Prepare track project report using Primavera software.

CO3Plan scheduling and track construction projects using MS project and analyze the risks factors in projects

1. Quantity takeoff, Preparation and delivery of the bid or proposal of an engineering construction project.
2. Design of a simple equipment information system for a construction project.
3. Scheduling of a small construction project using Primavera scheduling systems including reports and tracking.
4. Scheduling of a small construction project using tools like MS project scheduling systems including reports and tracking.
5. Simulation models for project risk analysis.

Total: 45 hrs.

REFERENCE BOOKS:

1. Krishnamoorthy .C.S and Rajeev .S, Computer Aided Design, Narosa publishing house, New Delhi, 2001.

2. Harrison .H .B, Structural Analysis and Design, vol. I & II, Pergamon press, 2001.

3. Billy E. Giliet Introduction to Operation Research - Computer Oriented Algorithmic Approach, Tata McGraw Hill, 2000.

4. Paulson. B.R., Computer Applications in Construction, McGraw Hill, 2005.

5. Feigenbaum .L, Construction Scheduling with Primavera Project Planner, Prentice Hall Inc., 2009.

P19CEM204	Mini Project	L T P C 0 0 4 2

COURSE OUTCOMES

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

CO1. Identify Construction Engineering problems reviewing available literature.

CO2. Study different techniques used to analyze complex Construction Engineering and Management systems.

CO3. Work on the solutions given and present solution by using his/her technique applying engineering principles.

Syllabus Contents: **30 Hrs.**

Mini Project will have mid semester presentation and end semester presentation. Mid Semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Semester and End Semester will be monitored by the departmental committee.

P19CEM510	Project Safety Management	L T P C 3 0 0 3

COURSE OUTCOMES

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

CO1 study the accountabilities and responsibilities for the delivery of safety strategy and performance.

CO2 know appropriate safety information and training related programme.

CO3 describe the safety measurements and record keeping.

CO4 ensure that all staff is provided with adequate and appropriate safety information

CO5 provide the necessary training to build and maintain meaningful aerodrome operational safety leadership skills.

UNIT-I: CONSTRUCTION ACCIDENTS **9 Hrs**

Accidents and their Causes – Human Factors in Construction Safety – Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications.

UNIT –II: SAFETY PROGRAMMES **9 Hrs**

Problem Areas in Construction Safety – Elements of an Effective Safety Programme – Job-Site Safety Assessment – Safety Meetings – Safety Incentives-Implementation of 5'S

UNIT –III: CONTRACTUAL OBLIGATIONS **9 Hrs**

Contractual obligations - Safety in Construction Contracts – Substance Abuse – Safety Record Keeping.

UNIT –IV: DESIGNING FOR SAFETY **9 Hrs**

Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Sub contractual Obligation – Project Coordination and Safety Procedures –Workers Compensation.

UNIT –V: OWNERS' AND DESIGNERS' OUTLOOK **9 Hrs**

Owner's responsibility for safely – Owner preparedness – Role of designer in ensuring safety – Safety clause in design document.

Total: 45 hrs.

REFERENCE BOOKS:

1. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.

2. TamilNadu Factory Act, Department of Inspectorate of factories, Tamil Nadu. Health Management, Prentice Hall Inc., 2001.

3. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997.

P19CEM511	Construction Equipment and Management	L T P C 3 0 0 3

COURSE OUTCOMES

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

CO1 know about the management of equipments and their utilization.

CO2 recognize principles of effective utilization of earthwork equipments.

CO3 understand the basic of construction equipments.

CO4 know about the materials handling in construction site.

CO5 recognize the productivity of equipment management.

UNIT-I: EQUIPMENT MANAGEMENT **9 Hrs**

Identification –Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment – Depreciation Analysis, Methods of calculation of depreciation- Safety Management.

UNIT –II: EARTHWORK EQUIPMENT **9 Hrs**

Fundamentals of Earth Work Operations - Earth Moving operations-Types of Earthwork Equipment - Tractors, Motor Graders, Scrapers, Front end Loaders, Earth Movers – capacity calculations.

UNIT –III: OTHER CONSTRUCTION EQUIPMENTS **9 Hrs**

Equipment for Dredging, Trenching, Tunneling, Drilling and Blasting. Equipment for compaction - Types of pumps used in Construction - Equipment for Grouting - Pile Driving Equipment- Equipment of Erection and demolition.

UNIT –IV: MATERIALS HANDLING EQUIPMENT **9 Hrs**

Forklifts and related equipment - Portable Material Bins - Conveyors - equipment used in demolition – Chain Pulley Blocks.

UNIT –V: EQUIPMENT FOR PRODUCTION OF AGGREGATE AND CONCRETING **9 Hrs**

Crushers – Feeders - Screening Equipment - Batching and Mixing Equipment – Hauling equipment - Pouring and Pumping Equipment – Ready mixed concrete carriers.

Total: 45 hrs.

REFERENCE BOOKS:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder.C, "Construction Planning Equipment and Methods", McGraw Hill. Singapore 2005.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers, Delhi, 2008.
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers Delhi, 2008.
4. Mahesh Varma .Dr. "Construction Equipment and its planning and application", Metropolitan Book Company, New Delhi, 2003.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Mechanical Engineering
Branch: M.E. Engineering Design

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19END201	Mechanical Vibrations	3	0	0	3
2	P19END202	Integrated Product and Processes Development	3	0	0	3
3	P19END203	Design of Hydraulic and Pneumatic System	3	0	0	3
4	P19END523	**Elective** – Product Data Management	3	0	0	3
5	P19END526	**Elective** – Mechanics of Composite Materials	3	0	0	3
6	P19GE702	**Audit Course** - Stress Management by Yoga	2	0	0	0
Practical						
7	P19END204	Analysis and Simulation Laboratory	0	0	4	2
					Total Credits	**17**

Approved by

Chairman, Mechanical Engineering BOS Dr.D.Senthilkumar

Member Secretary, Academic Council **Dr.R.Shivakumar**

Chairperson, Academic Council & Principal **Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/MECH, Second Semester ME END Students and Staff, COE

Course Code	P19END201	L	T	P	C
Course Name	MECHANICAL VIBRATIONS	3	-	-	3

Pre-requisite subjects: Engineering Mechanics, Strength of materials, Kinematics and Dynamics of Machinery

Course Outcomes

Upon completion of this course the students will be able to

CO1	Understand fundamentals of vibrations and virtual work.
CO2	Gain knowledge on two degree freedom system, vibration absorber and isolator.
CO3	Impart knowledge on multi degree freedom system and numerical methods for fundamental frequencies.
CO4	Explain vibration of continuous systems like strings, rods and plates.
CO5	Provide the experimental methods in measuring vibration.

Unit I FUNDAMENTALS OF VIBRATION L 8 T 3

Introduction – Single degree freedom free vibration systems – Damped vibrations – Single degree freedom forced vibration with elastically coupled viscous dampers, System Identification from frequency response, Support motion, Duhamel's Integral – Impulse Response function – Virtual work – Lagrange's equation-– Transient Vibration

Unit II TWO DEGREE FREEDOM SYSTEM L 8 T 3

Free vibration of spring-coupled system – mass coupled system – Vibration of two degree freedom system – Forced vibration – Vibration Absorber – Vibration isolation.

Unit III MULTI-DEGREE FREEDOM SYSTEM L 12 T 3

Normal mode of vibration – Flexibility Matrix and Stiffness matrix – Eigen values and eigen vectors – orthogonal properties – Modal matrix-Modal Analysis – Forced Vibration by matrix inversion – Modal damping in forced vibration – Numerical methods for fundamental frequencies.

Unit IV VIBRATION OF CONTINUOUS SYSTEMS L 8 T 3

Systems governed by wave equations – Vibration of strings – vibration of rods – Euler Equation for Beams – Effect of Rotary inertia and shear deformation – Vibration of plates.

Unit V EXPERIMENTAL METHODS IN VIBRATION ANALYSIS L 9 T 3

Vibration instruments – Vibration exciters Measuring Devices – Analysis – Vibration Tests – Free and Forced Vibration tests. Examples of Vibration tests – Industrial, case studies.

Total : 45 Hrs

Content Beyond Syllabus

1. Basics mechanics
2. Basics of matrix

1. Benson H.Tongue, Principles of Vibration, 2nd edn., Oxford University Press, NY, 2002 ISBN: 9780195142464
2. Thomson, W.T. – "Theory of Vibration with Applications", (5th Edition) CBS Publishers and Distributors, New Delhi, 1990. ISBN-13: 978-0136510680.
3. Rao, J.S., & Gupta, K. – "Ind. Course on Theory and Practice Mechanical Vibration", New Age International(P)Ltd.,1984. ISBN:978-81-224-1215-4 PublicationYear Edition:2nd Reprint : Aug, 2014
4. Den Hartog, J.P, "Mechanical Vibrations," Dover Publications, 4th Edition, 1990. ISBN 0-486-65407-9,
5. Rao, S.S.," Mechanical Vibrations," Addison Wesley Longman, 13th Edition, 1995. ISBN 13: 9780201065503

Course Code	P19END202	L	T	P	C
Course Name	INTEGRATED PRODUCT AND PROCESSES DEVELOPMENT	3	0	0	3

Pre-requisite subjects: Process planning and cost estimation, Concept of Engineering design, Industrial Management and Engineering.

Course Outcomes

Upon completion of this course the students will be able to

CO1	Impart knowledge on product development processes and organizations.
CO2	Identify customer needs, product planning processes and allocating resources and timing.
CO3	Apply knowledge on product specifications.
CO4	Define the concept selection and measure customer response.
CO5	Provide product architecture and level design issues.

Unit I INTRODUCTION L 9 T 0

Characteristics of Successful Product Development-Interdisciplinary activity-Duration and Costs of Product Development- Challenges of Product Development -Development Processes and Organizations-A Generic Development Process-Concept Development: The Front-End Process Adapting the Generic Product Development Process- The AMF Development Process-Product Development Organizations-The AMF Organization

Unit II PRODUCT PLANNING L 9 T 0

Product Planning Process- Identifying Opportunities- Evaluating and Prioritizing Projects- Allocating Resources and Timing- Pre-Project Planning-Reflect on the Results and the Process-Identifying Customer Needs- Raw Data from Customers- Interpreting Raw Data in Terms of Customer Needs-Organizing the Needs into a Hierarchy-Establishing the Relative Importance of the Needs-Reflecting on the Results and the Process

Unit III PRODUCT SPECIFICATIONS L 9 T 0

Specifications - Specifications Established - Establishing Target Specifications-Setting the Final Specifications-Concept Generation-The Activity of Concept Generation-Clarify the Problem- Search Externally-Search Internally-Explore Systematically- Reflect on the Results and the Process.

Unit IV CONCEPT SELECTION L 9 T 0

Concept Selection- Overview of Methodology-Concept Screening-Concept Testing-Define the Purpose of the Concept Test- Choose a Survey Population- Choose a Survey Format- Communicate the Concept- Measure Customer Response-Interpret the Results-Reflect on the Results and the Process.

Unit V PRODUCT ARCHITECTURE L 9 T 0

Product Architecture-Implications of the Architecture-Establishing the Architecture-Delayed Differentiation-Platform Planning-Related System-Level Design Issues

Total: 45 Hrs

Content Beyond Syllabus

1. Supply chain mechanism
2. Cost estimation

Learning Resources

Reference Books

1. Product Design and Development, Karl T. Ulrich and Steven .D Epinger, McGraw-Hill International Edns. 4th edition 2013. ISBN-13: 978-0070658110
2. Kevien Otto and Kristin Wood, "Product Design" Pearson Publication,3rd Edition, 2012, ISBN-13: 9780130212719
3. Stuart Pugh, "Tool Design – Integrated Methods for successful Product Engineering", Addison Wesley Publishing, Neyork, 1991,ISBN: 020141639.
4. Stephen Rosenthal, Business One Orwin "Effective Product Design and Development", Homewood, 1992,ISBN:1-55623-603-4
5. Kemnneth Crow,"Concurrent Engg. /Integrated Product Development", DRM Associates, 26/3,Via Olivera, Palos Verdes, CA 90274(310) 377-569,Workshop Book.

Course Code	P19END203	L	T	P	C
Course Name	DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS	3	-	-	3

Pre-requisite subjects: Fluid mechanics, Hydraulic and pneumatics and Mechatronics

Course Outcomes

Upon completion of this course the students will be able to

CO1	To impart knowledge on hydraulic systems and its characteristics
CO2	To create expertise in control of pressure - direction and flow control valves
CO3	To gain knowledge of hydraulic equipment and to design hydraulic and electro-hydraulic systems for automation, pneumatic circuits.
CO4	To learn about pneumatic systems and circuits - cascade methods - mapping methods - step counter method
CO5	Plc, cascade, step counter and k-v mapping methods and to design low cost automation systems

Unit I OIL HYDRAULIC SYSTEMS AND HYDRAULIC ACTUATORS L 9 T 0

Hydraulic Power Generators – Selection and specification of pumps, pump characteristics- Determination of volumetric, mechanical and overall efficiencies of positive displacement pumps. Linear and Rotary Actuators – selection, specification and characteristics.

Unit II CONTROL AND REGULATION ELEMENTS L 9 T 0

Pressure - direction and flow control valves - relief valves, non-return and safety valves - actuation systems. Electrical control solenoid valves, relays, Electro hydraulic servo valves.

Unit III HYDRAULIC CIRCUITS L 9 T 0

Reciprocation, quick return, sequencing, synchronizing circuits - accumulator circuits - industrial circuits - press circuits - hydraulic milling machine - grinding, planning, copying, - forklift, earth mover circuits- design and selection of components - safety and emergency mandrels.

Unit IV PNEUMATIC SYSTEMS AND CIRCUITS L 9 T 0

Pneumatic fundamentals - control elements, position and pressure sensing - logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods - step counter method - compound circuit design - combination circuit design.

Unit V INSTALLATION, MAINTENANCE AND SPECIAL CIRCUITS L 9 T 0

Pneumatic equipments- selection of components - design calculations – application -fault finding - hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.

Total : 45 Hrs

Content Beyond Syllabus

1. PLC programming
2. SCADA

Learning Resources

Reference books

1. Bolton. W., "Pneumatic and Hydraulic Systems ", Butterworth –Heinemann, 1997.
2. Antony Espossito, "Fluid Power with Applications", Prentice Hall, 1980.
3. Dudleyt, A. Pease and John J. Pippenger, Industrial Hydraulics, Tata MGraw Hill Prentice Hall, 1985.
4. Andrew Parr, "Hydraulic and Pneumatics" (HB), Jaico Publishing House, 2004.
5. Majumdar, S.R., Oil Hydraulic Systems, Principles and Maintenance, Tata MGraw Hill Prentice Hall, 2001.

Course Code	**P19END523**	L	T	P	C
Course Name	**PRODUCT DATA MANAGEMENT**	3	-	-	3

Pre-requisite subjects: Industrial Management and Engineering, Total Quality Management and Integrated product and process development.

Course Outcomes

Upon completion of this course the students will be able to

CO1	Explain software development in PDM
CO2	List the components of PDM
CO3	Construct Configuration Management
CO4	Demonstrate work flow and life cycle of products
CO5	List the configuration methods

Unit I INTRODUCTION L 9 T 0

Introduction to PDM-present market constraints-need for collaboration - internet and developments in server-client computing.

Unit II COMPONENTS OF PDM L 9 T 0

Components of a typical PDM setup-hardware and software-document management-creation and viewing of documents-creating parts-versions and version control of parts and documents-case studies.

Unit III CONFIGURATION MANAGEMENT L 9 T 0

Base lines-product structure-configuration management-case studies.

Unit IV PROJECTS AND ROLES L 9 T 0

Creation of projects and roles-life cycle of a product- life cycle management-automating information flow-work flows- creation of work flow templates-life cycle-work flow integration-case studies.

Unit V CHANGE MANAGEMENT GENERIC PRODUCTS AND VARIANTS L 9 T 0

Change issue- change request- change investigation- change proposal - change activity - case studies. Data Management Systems for FEA data **-** Product configurator - comparison between sales configuration and product configurator-generic product modeling in configuration modeler-use of order generator for variant creation-registering of variants in product register-case studies.

Total : 45 hrs

Content Beyond Syllabus

1. Basics of FEA
2. Cloud computing

Learning Resources

Reference Books

1. Kevin Otto, Kristin Wood, "Product Design", Pearson, 2001.
2. Daniel Amor, "The E-Business Revolution", Prentice-Hall, 2000.
3. David Bed worth. Mark Henderson & Phillip Wolfe. "Computer Integrated Design and Manufacturing ". McGraw Hill Inc...1991.
4. Terry Quatrain. "Visual Modeling with Rational Rose and UML ". Addison Wesley...1998.
5. Wind-Chill R5.0Reference Manuals...2000.

Course Code	P19END526	L	T	P	C
Course Name	MECHANICS OF COMPOSITE MATERIALS	3	-	-	3

Pre-requisite subjects: Engineering Materials and metallurgy, Engineering Mechanics, Manufacturing Technology – I & II

Course Outcomes

Upon completion of this course the students will be able to

CO1	To understand the basic of composite materials
CO2	To provide knowledge of simple stresses, strains and deformation due to external loads and their relations
CO3	To provide knowledge of simple stresses, strains and deformation due to external loads and their relations
CO4	To impart knowledge in orthotropic materials and their manufacturing.
CO5	To learn the design guidelines

Unit I INTRODUCTION L 9 T 0

Definition – Need – General Characteristics, Applications. Fibers – Glass, Carbon, Ceramic and Aramid fibers. Matrices – Polymer, Graphite, Ceramic and Metal Matrices – Characteristics of fibers and matrices. Fiber surface treatments, Fillers and additives, Fiber content, density and void content.

Unit II MECHANICS L 9 T 0

Rule of mixture -volume and mass fractions – density - void content, Evaluation of four elastic moduli based on strength of materials approach and Semi-Empirical model-Longitudinal Young's modulus-transverse Young's modulus–major Poisson's ratio-In-plane shear modulus, Ultimate strengths of a unidirectional lamina. Characteristics of Fiber-reinforced lamina–laminates–lamination theory, Interlaminar stresses

Unit III PERFORMANCE L 9 T 0

Static Mechanical Properties – Fatigue and Impact Properties – Environmental effects – Long term properties, Fracture Behavior and Damage Tolerance.

Unit IV MANUFACTURING L 9 T 0

Bag Moulding – Compression Moulding – Pultrusion – Filament Winding – Other Manufacturing Processes – Quality Inspection methods. Processing of MMC –diffusion bonding – stir casting – squeeze casting.

Unit V DESIGN L 9 T 0

Failure Predictions, Laminate Design Consideration-design criteria-design allowables - design guidelines, Joint design-Bolted and Bonded Joints, Design Examples-Design of a tension member – design of a compression member – design of a beam-design of a torsional member, Application of FEM for design and analysis of laminated composites.

Total : 45 Hrs

Content Beyond Syllabus

1. Smart Materials
2. Performance study

Learning Resources

Reference books

1. Mallick, P.K., "Fiber Reinforced Composites: Materials, Manufacturing and Design", Marcel Dekker Inc, 1993.
2. Autar K. Kaw, "Mechanics of Composite Materials" CRC Press, 2006
3. Agarwal, B.D., and Broutman L.J., "Analysis and Performance of Fiber Composites", John Wiley and Sons, New York, 1990.
4. Ronald Gibson, "Principles of Composite Material Mechanics", Tata McGraw Hill, 1994.
5. Chawla K.K., "Composite materials", Springer – Verlag, 1987

		L	T	P	C
Course Code	**P19END204**				
Course Name	**ANALYSIS AND SIMULATION LABORATORY**	-	-	4	2

Pre-requisite subjects: Machine Drawing and CAD laboratory

Course Outcomes

Upon Completion of this course the students will be able to

CO1	Understand the basic concepts of modeling and analysis softwares like ANSYS / NASTRAN/ADAMS/MATLAB
CO2	Familiar with the meshing concepts and boundary conditions.
CO3	Know the solutions under various conditions.

Analysis of Mechanical Components – Use of FEA Packages, like ANSYS/ NASTRAN etc., include FEA analysis of

i) Machine elements under static loads ,Heat transfer in mechanical systems
ii) Determination of natural frequency ,Axi-Symmetric elements
iii) Non-linear systems

Use of kinematics and dynamics simulation software like ADAMS software. Analysis of velocity and acceleration for mechanical linkages of different mechanisms.

LIST OF EXPERIMENTS **Total : 45 Hrs**

1. Nodal Displacement of 1-D Bar
2. Displacement of Taper Plate
3. Displacement and Thermal Stress due to Static and Thermal
4. Nodal Displacement of Truss Member
5. Nodal Displacement of Thermal Stress due to Static and Thermal Load
6. Deflection of Beam Under UDL
7. Deflection of a Beam With Roller
8. Displacement and Von-Misses Stress Rectangular Plate Under Plane Stress
9. Displacement in a Thin Plane with a Circular Hole
10. Thermal Analysis of a Beam
11. Stress Analysis of an Axi-Symmetric Component
12. Model Analysis of a Cantilever-2D Plate
13. Structural Analysis of an L-Bracket
14. Harmonic Analysis of a Cantilever Beam
15. Heat Transfer in a Fin

List of Equipments

1. Computer workstation 20
2. Software requirement
   ANSYS / NASTRAN/ADAMS/MATLAB

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Mechanical Engineering
Branch: M.E. Industrial Safety Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19ISE201	Industrial Safety, Health And Environment Acts	3	0	0	3
2	P19ISE202	Fire Engineering And Explosion Control	3	0	0	3
3	P19ISE203	Electrical Safety	3	0	0	3
4	P19ISE509	**Elective** - Safety In Construction	3	0	0	3
5	P19ISE515	**Elective** - Safety In Mines	3	0	0	3
6	P19GE702	**Audit Course** – Stress Management By Yoga	2	0	0	0
Practical						
7	P19ISE204	Mini Project -Hazard Assessment In Industry	0	0	4	2
					Total Credits	**17**

Approved by

Chairman, Mechanical Engineering BOS
Dr.D.Senthilkumar

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/MECH, Second Semester ME IISE Students and Staff, COE

Course Code : P19ISE201

Course Name : INDUSTRIAL SAFETY HEALTH AND ENVIRONMENTAL ACTS

Lecture	-	4 Hrs/Week	Internal Marks	50
Tutorial	-	0 Hrs/Week	External Marks	50
Practical	-		Credits	4

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

Course Outcomes

C01 Explain the factory act regarding, health, safety and workers welfare.

C02 Explain the various aspects of the environmental act, powers and function of statutory authorities of central and state government.

C03 identify the list of hazardous and toxic chemical and the safety procedure to be followed.

C04 explain various Acts regarding boiler, motor vehicles, mines, construction workers, explosive pesticides.

C05 be familiar with the international acts and standards regarding occupational safety and health.

UNIT I FACTORIES ACT – 1948 L 12 T 0

Statutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young person's – special provisions – penalties and procedures-Tamilnadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948

UNIT II ENVIRONMENT ACT – 1986 L 12 T 0

General powers of the central government, prevention, control and abatement of environmental pollution-Biomedical waste (Management and handling Rules, 1989-The noise pollution (Regulation and control) Rules, 2000-The Batteries (Management and Handling Rules) 2001- No Objection certificate from statutory authorities like pollution control board. Air Act 1981 and Water Act 1974: Central and state boards for the prevention and control of air pollution-powers and functions of boards – prevention and control of air pollution and water pollution – fund – accounts and audit, penalties and procedures.

UNIT III MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES 1989 L 12 T 0

Definitions – duties of authorities – responsibilities of occupier – notification of major accidents – information to be furnished – preparation of offsite and onsite plans – list of hazardous and toxic chemicals – safety reports – safety data sheets.

UNIT IV OTHER ACTS AND RULES L 12 T 0

Indian Boiler Act 1923, static and mobile pressure vessel rules (SMPV), motor vehicle rules, mines act 1952, workman compensation act, rules – electricity act and rules – hazardous wastes (management and handling) rules, 1989, with amendments in 2000- the building and other construction workers act 1996., Petroleum rules, Gas cylinder rules-Explosives Act 1983-Pesticides Act

UNIT V INTERNATIONAL ACTS AND STANDARDS L 12 T 0

Occupational Safety and Health act of USA (The Williames-Steiger Act of 1970) – Health and safety work act (HASAWA 1974, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).

Total Number of Periods: 60

Content beyond syllabus

- Seoul declarations
- National pension scheme
- Debt bondage in India
- Employment of children (Sumangali)

Learning Resources

Text book:

1. The Factories Act 1948, Madras Book Agency, Chennai, 2000

2. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt.Ltd. New Delhi.

3. Water (Prevention and control of pollution) act 1974, Commercial Law publishers (India) Pvt.Ltd. New Delhi.
4. Air (Prevention and control of pollution) act 1981, Commercial Law Publishers (India) Pvt.Ltd. New Delhi.

References:

1. The Indian boilers act 1923, Commercial Law Publishers (India) Pvt.Ltd. Allahabad.

2. The Mines Act 1952, Commercial Law Publishers (India) Pvt.Ltd. Allahabad.

3. The manufacture, storage and import of hazardous chemical rules 1989, Madras Book Agency, Chennai.

P19ISE202

FIRE ENGINEERING AND EXPLOSION CONTROL

Lecture	-	3 Hrs/Week	Internal Marks	50
Tutorial	-	0 Hrs/Week	External Marks	50
Practical	-		Credits	3

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

Course Outcomes

C01 Estimate hazards potential various types of fires and discuss the real life situations of fire accidents.

C02 Explain and use various types of fire extinguishers and about escape and rescue operations.

C03 Have knowledge of various industrial fire protection systems like alarms and detection systems and modes of fire fighting.

C04 Analyze various fire safety measures to be followed in buildings and the rules to be followed for certification processes

C05 Analize various types and dangers of explosions and the systems used for relief, venting and suppression.

UNIT I PHYSICS AND CHEMISTRY OF FIRE **L 9 T 0**

Fire properties of solid, liquid and gases - fire spread - toxicity of products of combustion - theory of combustion and explosion – vapour clouds – flash fire – jet fires – pool fires – unconfined vapour cloud explosion, shock waves - auto-ignition – boiling liquid expanding vapour explosion – case studies – Flixborough, Mexico disaster, Pasedena Texas, Piper Alpha, Peterborough and Bombay Victoria dock ship explosions.

UNIT II FIRE PREVENTION AND PROTECTION **L 9 T 0**

Sources of ignition – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers – fire stoppers – hydrant pipes – hoses – monitors – fire watchers – layout of stand pipes – fire station-fire alarms and sirens – maintenance of fire trucks – foam generators – escape from fire rescue operations – fire drills – notice-first aid for burns.

UNIT III INDUSTRIAL FIRE PROTECTION SYSTEMS **L 9 T 0**

Sprinkler-hydrants-stand pipes – special fire suppression systems like deluge and emulsifier, selection criteria of the above installations, reliability, maintenance, evaluation and standards – alarm and detection systems. Other suppression systems – CO_2 system, foam system, dry chemical powder (DCP) system, halon system – need for halon replacement – smoke venting. Portable extinguishers – flammable liquids – tank farms – indices of inflammability-fire fighting systems.

UNIT IV BUILDING FIRE SAFETY **L 9 T 0**

Objectives of fire safe building design, Fire load, fire resistant material and fire testing – structural fire protection – structural integrity – concept of egress design - exists – width calculations – fire certificates – fire safety requirements for high rise buildings – snookers.

UNIT V EXPLOSION PROTECTING SYSTEMS **L 9 T 0**

Principles of explosion-detonation and blast waves-explosion parameters – Explosion Protection, Containment, Flame Arrestors, isolation, suppression, venting, explosion relief of large enclosure explosion venting-inert gases, plant for generation of inert gas-rupture disc in process vessels and lines explosion, suppression system based on carbon dioxide (CO_2) and halons-hazards in LPG, ammonia (NH_3), sulphur dioxide (SO_3), chlorine (CL_2) etc.

TOTAL NUMBER OF PERIODS : 45 Hrs

Content beyond syllabus

Institution of fire engineers

Building service engineering

Fire modeling

Smoke control and management

Wild fire management

Learning Resources

TEXT BOOK

1. Derek, James, “Fire Prevention Hand Book”, Butter Worths and Company, London, 1986.
2. Gupta, R.S., “Hand Book of Fire Technology” Orient Longman, Bombay 1977.

REFERENCES

1. “Fire Prevention and fire fighting”, Loss prevention Association, India.
2. “Accident Prevention manual for industrial operations” N.S.C., Chicago, 1982.
3. Dinko Tuhtar, “Fire and explosion protection”
4. “Davis Daniel et al, “Hand Book of fire technology”
5. Fire fighters hazardous materials reference book Fire Prevention in Factories”, an Nostrand Rein Hold, New York, 1991.
6. Relevant Indian Acts and rules, Government of India.

Course Code : P19ISE203

Course Name : ELECTRICAL SAFETY

Lecture	-	3 Hrs/Week	Internal Marks	50
Tutorial	-	0Hrs/Week	External Marks	50
Practical	-		Credits	3

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

Course Outcomes

C01 know the working principles of basic electric instruments and verify whether they satisfy national and international standards.

C02 differentiate various types of electrical hazards and know various types of insulation methods to prevent those hazards.

C03 Protect against over voltage and under voltage. Safely handling hand held electrical tools.

C04 Select devices considering the role of environment and plan for maintenance

C05 Separate hazardous zones from safe area and select equipments based on their suitability of that particular zone.

UNIT I CONCEPTS AND STATUTORY REQUIREMENTS L 9 T 0

Introduction – electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety – first aid-cardio pulmonary resuscitation(CPR).

UNIT II ELECTRICAL HAZARDS L 9 T 0

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications-excess energy current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc-ignition energy-national electrical safety code ANSI.

Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

UNIT III PROTECTION SYSTEMS L 9 T 0

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit protection-no load protection-earth fault protection. FRLS insulation-insulation and continuity test-system grounding-equipment grounding-earth leakage circuit breaker (ELCB)-cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards-Personal protective equipment – safety in handling hand held electrical appliances tools and medical equipments.

UNIT IV SELECTION, INSTALLATION, OPERATION AND MAINTENANCE L 9 T 0

Role of environment in selection-safety aspects in application - protection and interlock-self diagnostic features and fail safe concepts-lock out and work permit system-discharge rod and earthing devices safety in the use of portable tools-cabling and cable joints-preventive maintenance.

UNIT V HAZARDOUS ZONES **L 9 T 0**

Classification of hazardous zones-intrinsically safe and explosion proof electrical apparatus-increase safe equipment-their selection for different zones-temperature classification-grouping of gases-use of barriers and isolators-equipment certifying agencies.

TOTAL NUMBER OF PERIODS = 45

Content beyond syllabus

- IEC 60335
- High voltage testing
- Double insulation
- Leakage current

Learning Resources

TEXT BOOK:

1. Fordham Cooper, W., "Electrical Safety Engineering" Butterworth and Company, London, 1986.
2. Indian Electricity Act and Rules, Government of India.

REFERENCES

1."Accident prevention manual for industrial operations", N.S.C.,Chicago, 1982.
2. Indian Electricity Act and Rules, Government of India.
3. Power Engineers – Handbook of TNEB, Chennai, 1989.
4. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt.LTd., England, 1988.

Course Code : P19ISE509

Course Name : SAFETY IN CONSTRUCTION

Lecture	-	3 Hrs/Week	Internal Marks	50
Tutorial	-	0 Hrs/Week	External Marks	50
Practical	-		Credits	3

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

Course Outcomes

C01 Analyze and prevent the causes of accidents in a construction site and also to decide the amount of compensation

C02 Explain various hazards associated with a construction site and how to work safely in each type of project

C03 know the laws of safety to be followed when working at height and methods of preventing fall

C04 operate various construction equipments and to train others in safe handling those equipments

C05 Explain what are the safety measures to be taken during a demolition process

UNIT I ACCIDENTS CAUSES AND MANAGEMENT SYSTEMS L 9 T 0

Problems impeding safety in construction industry- causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident – construction regulations, contractual clauses – Pre contract activates, preconstruction meeting - design aids for safe construction – permits to work – quality assurance in construction – compensation – Recording of accidents and safety measures – Education and training

UNIT II HAZARDS OF CONSTRUCTION AND PREVENTION L 9 T 0

Excavations, basement and wide excavation, trenches, shafts – scaffolding , types, causes of accidents, scaffold inspection checklist – false work – erection of structural frame work, dismantling – tunneling – blasting, pre blast and post blast inspection – confined spaces – working on contaminated sites – work over water - road works – power plant constructions.

UNIT III WORKING AT HEIGHTS L 9 T 0

Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffoldings , requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection , safety belts, safety nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.

UNIT IV CONSTRUCTION MACHINERY L 9 T 0

Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder's hoist, winches, chain pulley blocks – use of conveyors – concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoisting cranes – use of conveyors and mobile cranes.

UNIT V SAFETY IN DEMOLITION WORK **L 9 T 0**

Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods – interesting experiences at the construction site against the fire accidents.

TOTAL NUMBER OF PERIODS = 45

Content beyond syllabus

- construction fatality rates
- Safety of non workers
- High visibility clothing
- Temporary fencing

Learning Resources

Text Book

1. Hudson, R.,"Construction hazard and Safety Hand book, Butter Worth's, 1985.

REFERENCES

1. Jnathea D.Sime, "Safety in the Build Environment", London, 1988.
2. V.J.Davies and K.Thomasin "Construction Safety Hand Book" Thomas Telford Ltd., London, 1990.
3. Handbook of OSHA Construction safety and health charles D. Reese and James V. Edison

Course Code : P19ISE515

Course Name : SAFETY IN MINES

Lecture	-	3 Hrs/Week	Internal Marks	50
Tutorial	-	0 Hrs/Week	External Marks	50
Practical	-		Credits	3

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

Course Outcomes

C01 analyze the causes of accidents in opencast mines and ways to handle them

C02 Explain various hazards which could happen in an underground mines and ways to mitigate them

C03 know the reasons for the collapse of tunnels and the necessary personal protective equipments to be worn for saving lives.

C04 Explain the basic concepts of risk assessment related to mines and do FMEA and other types of analyzes

C05 Analyze the previous accidents happened in mine and learn preventing methods by modeling them

UNIT I OPENCAST MINES **L 9 T 0**

Causes and prevention of accident from: Heavy machinery, belt and bucket conveyors, drilling, hand tools-pneumatic systems, pumping, water, dust, electrical systems, fire prevention. Garage safety – accident reporting system- working condition- safe transportation – handling of explosives.

UNIT II UNDERGROUND MINES **L 9 T 0**

Fall of roof and sides-effect of gases-fire and explosions-water flooding-warning sensors-gas detectors-occupational hazards-working conditions-winding and transportation.

UNIT III TUNNELLING **L 9 T 0**

Hazards from: ground collapse, inundation and collapse of tunnel face, falls from platforms and danger from falling bodies. Atmospheric pollution (gases and dusts) – trapping –transport-noise electrical hazards-noise and vibration from: pneumatic tools and other machines – ventilation and lighting – personal protective equipment.

UNIT IV RISK ASSESSMENT **L 9 T 0**

Basic concepts of risk-reliability and hazard potential-elements of risk assessment – statistical methods – control charts-appraisal of advanced techniques-fault tree analysis-failure mode and effect analysis – quantitative structure-activity relationship analysis-fuzzy model for risk assessment.

UNIT V ACCIDENT ANALYSIS AND MANAGEMENT **L 9 T 0**

Accidents classification and analysis-fatal, serious, minor and reportable accidents – safety audits recent development of safety engineering approaches for mines-frequency rates-accident occurrence investigation- measures for improving safety in mines-cost of accident-emergency preparedness – disaster management

TOTAL NUMBER OF PERIODS = 45

Content beyond syllabus

- Black lung diseases
- Reverberant effects
- Methane gas
- Abandoned mines

Learning Resources

Text Book

1. “Mine Health and Safety Management”, Michael Karmis ed., SME, Littleton, Co.2001.

REFERENCES

1. Kejiriwal, B.K. Safety in Mines, Gyan Prakashan, Dhanbad, 2001.
2. DGMS Circulars-Ministry of Labour, Government of India press, OR Lovely Prakashan-DHANBAD, 2002.

Course Code	**P19ISE204**
Course Name	**HAZARD ASSESSMENT IN INDUSTRY – MINI PROJECT**

Lecture	-		Internal Marks	60
Tutorial	-		External Marks	40
Practical	4	Hrs/Week	Credits	2

Pre-requisites subject: Nil.

Course Outcomes	**Upon completion of this course the students will be able to**	
	CO1	Use their theoretical knowledge for understanding real situations
	CO2	Use their skills to design safe systems
	CO3	Use various software packages to analyze the hazards levels in risky situations and recommend appropriate remedies

OBJECTIVE:

- It is proposed to carryout detailed analysis of real life unsafe situation and propose possible remedies without violating government norms. This helps the students to get familiar with respect to the general conditions of industrial environment and workers.

OUTCOME:

- It helps the students to get familiarized with everyday problems in implementing safety standards and get the experience to solve the situations. Each student is required to study any industry and learn the practical aspects of unsafe working conditions. They are expected to submit report about the work they did to improve safety practices in an industry.

TOTAL NUMBER OF PERIODS = 60

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Electrical and Electronics Engineering
Branch: M.E. Power Electronics and Drives

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19PED201	Solid State DC Drives	3	1	0	4
2	P19PED202	Solid State AC Drives	3	1	0	4
3	P19PED203	Special Electrical Machines and their Controllers	3	0	0	3
4	P19PED506	**Elective -** Smart Grid	3	0	0	3
5	P19PED508	**Elective -** Microcontrollers and DSP based System Design	3	0	0	3
6	P19GE702	**Audit Course –** Stress Management by Yoga	2	0	0	0
Practical						
7	P19PED204	Power Electronics and Drives Laboratory	0	0	4	2
					Total Credits	**19**

Approved by

Chairperson, **Electrical and Electronics Engineering BOS**
Dr.S.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/EEE, Second Semester ME PED Students and Staff, COE

P19PED201 SOLID STATE OF DC DRIVES 3 1 0 4

COURSE OUTCOMES:

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

1. Ability to acquire and apply knowledge of mathematics and converter/machine dynamics in Electrical engineering.
2. Ability to understand the steady state operation and transient dynamics of a motor load system.
3. Ability to formulate, design, simulate power supplies for generic load and for machine loads.
4. Analyze and design the current and speed controllers for a closed loop solid state DC motor drive.
5. Design digital control DC drive circuits for various motor control applications.

UNIT I DC MOTORS FUNDAMENTALS AND MECHANICAL SYSTEMS 12

DC motor- Types, induced emf, speed-torque relations; Speed control – Armature and field speed control; Ward Leonard control – Constant torque and constant horse power operation - Introduction to high speed drives and modern drives. Characteristics of mechanical system – dynamic equations, components of torque, types of load; Requirements of drives characteristics – multi-quadrant operation; Drive elements, types of motor duty and selection of motor rating.

UNIT II CONVERTER CONTROL 12

Principle of phase control – Fundamental relations; Analysis of series and separately excited DC motor with single-phase and three-phase converters – waveforms, performance parameters, performance characteristics. Continuous and discontinuous armature current operations; Operation with free wheeling diode; Implementation of braking schemes; Drive employing dual converter.

UNIT III CHOPPER CONTROL 12

Introduction to time ratio control and frequency modulation; Class A, B chopper controlled DC motor – performance analysis, multi-quadrant control - Chopper based implementation of braking schemes; Multi-phase chopper;

UNIT IV CLOSED LOOP CONTROL 12

Modeling of drive elements – Equivalent circuit, transfer function of self, separately excited DC motors; Linear Transfer function model of power converters; Sensing and feeds back elements - Closed loop speed control – current and speed loops, P, PI and PID controllers – response comparison.

UNIT V DIGITAL CONTROL OF D.C DRIVE AND APPLICATIONS 12

Phase Locked Loop and micro-computer control of DC drives; Applications - Rolling mills, Traction, Solar powered pump drives, Battery powered vehicles (Block diagram of subsystems).

Lecture: 45, Tutorial: 15, Total: 60

REFERENCES

1. Gopal K Dubey, “Power Semiconductor controlled Drives”, Prentice Hall Inc., New Yersy, 1989.
2. R. Krishnan, “Electric Motor Drives – Modeling, Analysis and Control”, Prentice-Hall of India Pvt. Ltd., New Delhi, 2003.
3. Gobal K. Dubey, “Fundamentals of Electrical Drives”, Narosal Publishing House, New Delhi.
4. Vedam Subramanyam, “Electric Drives – Concepts and Applications”, Tata McGraw-Hill publishing company Ltd., New Delhi, 2002.
5. P.C Sen “Thyristor DC Drives”, John wiely and sons, New York, 1981.

P19PED202 **SOLID STATE OF AC DRIVES** **3 1 0 4**

COURSE OUTCOMES:

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

1. Explain the steady state operation and transient dynamics of a motor load system.
2. Apply knowledge of mathematics and converter/machine dynamics in Electrical engineering.
3. Formulate, design, simulate power supplies for generic load and for machine loads.
4. Ability to analyze, comprehend, design and simulate alternating current motor based frequency drives.
5. Analyze the operation of VSI & CSI and field oriented fed induction motor control.

UNIT 1 FUNDAMENTALS OF **AC MOTORS** **12**

Steady state performance equations- Rotating Magnetic Field- Torque production, Equivalent circuit- Performance of the machine with Variable Voltage-Variable frequency operation, constant Volt/Hz operation, Slip power recovery – Static Kramer Drive - Synchronous Drives.

UNIT II VSI AND CSI FED INDUCTION MOTOR CONTROL **12**

AC voltage control circuit- six step inverter voltage control- closed loop variable frequency PWM inverter with dynamic braking- CSI fed IM variable frequency drives- comparison.

UNIT III FIELD ORIENTED CONTROL **12**

Field oriented control of induction machines- Theory-DC analogy- Direct or feedback vector control- Indirect or feed forward vector control- Flux vector estimation- Space vector modulation control.

UNIT IV DIRECT TORQUE CONTROL **12**

Direct torque control of induction machines- Torque expression with stator and rotor fluxes, DTC control strategy- Optimum switching vector selection- reduction or torque ripple methods.

UNIT V SYNCHRONOUS MOTOR DRIVES **12**

Wound field cylindrical rotor motor- Equivalent circuit –Performance equations of operation from a voltage source- Power factor control and V curves- Starting and braking, self control – Load commutated Synchronous motor drives – Brush and Brushless excitation.

Lecture: 45, Tutorial: 15, Total: 60

REFERENCES

1. R.Krishnan, 'Electric Motor Drives- Modeling, Analysis and Control', Prentice- Hall of India Pvt. Ltd., New Delhi, 2010.
2. Bimal K Bose, 'Modern Power Electronics and AC Drives', Pearson Education Asia 2002.
3. Gopal K Dubey, 'Power Semiconductor Controlled Drives', Prentice Hall Inc., New Jersey, 1999.
4. P.Vas, ' Sensorless Vector and Direct Torque Control', Oxford University Press, New York 1998.

P19PED203 SPECIAL ELECTRICAL MACHINES AND THEIR CONTROLLERS 3 0 0 3

COURSE OUTCOMES:

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

1. Explain the importance of advanced electrical motors.
2. Discuss the working principle and performance of advanced electrical motors such as stepper motors, Brushless dc motors and Switched Reluctance motors.
3. Design control techniques of electrical motors.
4. Discuss operation and characteristics of permanent magnet synchronous motors.
5. Design the controllers for Special machines.

UNIT I STEPPING MOTORS 9

Principle of operation – Classification – Construction and operation: VR motor, permanent magnet stepping motor, hybrid stepping motor. Monofilar and bifilar windings, Static characteristics – Dynamic characteristics – Modes of excitation- Micro stepping – Applications.

UNIT II SWITCHED RELUCTANCE MOTOR 9

Construction – Principle of operation – SRM Vs stepper motor, poles, phase and windings – Static torque production – Energy conversion loop – Partition of energy and effect of saturation – Converter circuits, Controls: current regulation, commutation, Torque-speed characteristics.

UNIT III BRUSHLESS DC MOTORS 9

Fundamentals of permanent magnets – demagnetization curve – comparison of conventional and brushless dc machine – Position detection using hall element – Basic three phase bipolar driven motor – Multi phase brushless motor – Square wave permanent magnet brushless motor – Torque and emf equations – Torque speed characteristics – Control methods.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation, EMF, power input and torque expressions, Phasor diagram, Power controllers,Torque speed characteristics, Self-control, Vector control, Current control schemes.

UNIT V CONTROLLER FOR SPECIAL MACHINES 9

Stepper motor: drive systems and circuit for open loop control – closed loop operation system using microprocessor, SRM: microcontroller based control, BLDC: six step commutations for PM Brushless dc motor and sinusoidal commutation drive.

Lecture: 45, Tutorial: 00, Total : 45

REFERENCES

1. Bimal K Bose, "Modern Power Electronics – Evolution, Technology and application", Jaico Publishing House, Mumbai, 2006.
2. JuhaPyrhonen, Valeria Hrabovcova, Scott semken, "Electrical Machines Drives Control – An Introduction", Wiley, 2016
3. Riazollah Firoozian, "Servo Motors and Industrial Control Theory", Springer, 2014.
4. Paul Acarnley, "Stepping Motors a guide to theory and practice" IET, 2007.
5. H A Toliyat, S Campbell, DSP Based Electro Mechanical Motion Control, CRC Press, 2019.

P19PED506 **SMART GRID** **3 0 0 3**

COURSE OUTCOMES:

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

1. Distinguish between smart grid and conventional grid.
2. Apply smart metering concepts to industrial and commercial installations.
3. Apply modern communication technologies for smart grid solutions.
4. Explain about the microgrid renewable energy systems.
5. Formulate solutions for the power quality issues in smart grid.

UNIT I INTRODUCTION 9

Introduction to Smart Grid - Evolution of Electric Grid - Concept of Smart Grid, Definitions, Need of Smart Grid- Concept of Robust &Self-Healing Grid - Present development & International policies in Smart Grid.

UNIT II SENSING, MEASUREMENTS, CONTROL AND AUTOMATION TECHNOLOGIES 9

Introduction to Smart Meters, Real Time Prizing, Smart Appliances - Automatic Meter Reading (AMR) - Outage Management System (OMS) - Plug in Hybrid Electric Vehicles(PHEV) - Vehicle to Grid, Smart Sensors - Home & Building Automation, Smart Substations, Substation Automation, Feeder Automation

UNIT III COMMUNICATION TECHNOLOGIES 9

Home Area Network (HAN) - Neighbourhood Area Network (NAN), Wide Area Network (WAN) - Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication - Wireless Mesh Network.Basics of CLOUD Computing &Cyber Security for Smart Grid - Broadband over Power line (BPL). IP based protocols

UNIT IV RENEWABLE ENERGY SYSTEMS AND MICROGRID 9

Plastic & Organic solar cells, Thin film solar cells - speed wind generators, fuel-cells, micro-turbines.
Smart storage like Battery, SMES, Pumped Hydro - Compressed Air Energy Storage - Concept of micro-grid, need & applications of micro-grid - Formation of micro-grid, Issues of interconnection - Protection & control of micro-grid

UNIT V POWER QUALITY IN SMART GRID 9

Power Quality issues of Grid connected Renewable Energy Sources -Power Quality Conditioners for Smart Grid - Web based Power Quality monitoring, Power Quality Audit.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCES

1. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011.
2. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, "Smart Grid: Technology and Applications", Wiley 2012.
3. Stuart Borlas'e, "Smart Grid: Infrastructure, Technology and solutions "CRC Press, 1st edition, 2012.
4. A.G.Phadke , "Synchronized Phasor Measurement and their Applications", Springer, 2nd edition, 2017

P19PED508 MICROCONTROLLERS AND DSP BASED SYSTEM DESIGN 3 0 0 3

COURSE COUTCOMES:

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

1. Design and implement Microcontrollers based systems.
2. Analyze PIC micro-Controller Registers, Instruction pipeline, Interrupts and Architecture.
3. Discuss the DSP computational building blocks and special types of addressing modes compared to normal microprocessor.
4. Explain about architecture, Registers, Instruction and features of ARM processor.
5. Apply microcontroller and DSP based design in real time applications concepts.

UNIT I 8051 PROGRAMMING 9

Assembly language programming – Arithmetic Instructions – Logical Instructions –Single bit Instructions – Timer Counter Programming – Serial Communication Programming - Interrupt programming – RTOS for 8051 – RTOS Lite – Full RTOS – Task creation and run – LCD digital clock/thermometer using Full RTOS.

UNIT II PIC MICROCONTROLLER 9

Architecture – memory organization – addressing modes – instruction set – PIC progrmming in Assembly & C – I/O port, Data Conversion, RAM & ROM Allocation, Timer programming, MPLAB-Timers – Interrupts, I/O ports - I2C bus-A/D converter - UART- CCP modules - ADC, DAC and Sensor Interfacing – Flash and EEPROM memories.

UNIT III ARM PROCESSORS 9

ARM Programmer's Model – Registers – Processor Modes – State of the processor – Condition Flags – ARM Pipelines – Exception Vector Table – ARM Processor Families – Typical 3 stage pipelined ARM organization–Introduction to ARM Memory Management Unit - ARM Addressing Modes – ARM Instruction Set Overview – Thumb Instruction Set Overview – LPC210X ARM Processor-Features.

UNIT IV DSP CONTROLLERS 9

Digital Signal Processor (DSP) - Architecture – Programming - Controller implementation using TMS 320 F 2407 and TMS 320 F 2812 for AC and DC Motor Control - Introduction to FPGA.

UNIT V SYSTEM DESIGN – CASE STUDY 9

Interfacing LCD Display – Keypad Interfacing - Generation of Gate signals for converters and Inverters - Motor Control: Stepper Motor Control - DC Motor Control – Servo motor control - AC Power Control – Measurement of frequency – Stand-alone Data Acquisition System.

Lecture: 45, Tutorial: 00, Total :45

REFERENCES:

1. I Scott Mackenzie and Raphael C.W. Phan, "The Micro controller", Pearson, Fourth edition 2012.
2. Rajkamal, "Microcontrollers-Architecture, Programming, Interfacing & System Design", 2ed, Pearson, 2012.
3. WilliamHohl "ARM Assembly Language Fundamental and Techniques" CRC Press Taylor & Francis, 2009.
4. Hamid A.Toliyat, Steven Campbell, 'DSP based electromechanical motion control', CRC Press, 2019.

P19PED204 POWER ELECTRONICS AND DRIVES LABORATORY 0 0 4 2

COURSE OUTCOMES:

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

1. Comprehensive understanding on the switching behaviour of Power Electronic Switches.
2. Explain the requisite knowledge necessary to appreciate the dynamical equations involved in the analysis of different Power electronics circuits.
3. Analyze, design and simulate different power Electronic Drives of AC and DC Machines.

LIST OF EXPERIMENTS

1. Speed control converter fed DC drive.
2. Speed control of chopper fed DC Drive
3. V/f control of induction motor drive using DSP.
4. FPGA controlled induction motor drive.
5. Micro controller based speed control of stepper motor.
6. DSPIC based speed control of BLDC motor.
7. DSP based speed control of SRM motor.
8. Power quality analysis of single phase & three phase non-linear system
9. Modeling and simulation of converter fed closed loop control of a DC motor
10. Modeling and simulation of dual converter fed DC motor drive
11. Modeling and simulation of chopper fed closed loop control of a AC motor
12. Modeling and simulation of four quadrant operation of three-phase induction motor
13. Modeling and simulation of VSI and CSI fed induction motor drive
14. Modeling and simulation of vector controlled induction motor drive
15. Modeling and simulation of self controlled synchronous motor drive

Total Hours : 60

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Electrical and Electronics Engineering
Branch: M.E. Power Systems Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19PSE201	Modern Protection of Power Systems	3	0	0	3
2	P19PSE202	Power System Dynamics and Stability	3	0	0	3
3	P19PSE203	Restructured Power Systems	3	0	0	3
4	P19PSE506	**Elective –** Smart Grid	3	0	0	3
5	P19PSE508	**Elective –** Artificial Intelligence Applicable to Power Systems	3	0	0	3
6	P19GE702	**Audit Course –** Stress Management by Yoga	2	0	0	0
Practical						
7	P19PSE204	Power Electronics Applied to Power Systems Laboratory	0	0	4	2
					Total Credits	**17**

Approved by

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

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/EEE, Second Semester ME PSE Students and Staff, COE

P19PSE201 MODERN POWER SYSTEM PROTECTION 3 0 0 3

COURSE OUTCOMES:

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

1. Describe the protection schemes for power system equipments
2. Evaluate static relays and their characteristics
3. Discuss different digital protection scheme
4. Illustrate modern trends in protective relaying
5. Evaluate various relay testing methods

UNIT I INTRODUCTION 9

General philosophy of protection – Characteristic functions of protective relays – Protection schemes for Transmission lines, Transformers, Generators, Motors – Bus bar protection – Back up protection.

UNIT II STATIC RELAYS AND THEIR CHARACTERISTICS 9

Static relays – Amplitude comparator, phase comparator – Static Over current relay – Synthesis of Impedance relay, MHO relay, Reactance relay, Quadrilateral relay, and Differential relay – Static frequency relay.

UNIT III DIGITAL PROTECTION 9

Numerical relay – Sampling frequency – Digital signal processing – Digital filtering in protective relays – Relays algorithms – Over current relays , Directional relay , Impedance relay , MHO relay , Differential relay - Quadrilateral relay .

UNIT IV MODERN TRENDS IN PROTECTIVE RELAYING 9

Carrier current pilot relaying – Phase comparison, carrier Aided distance protection – Travelling wave relays – Amplitude comparison relay , phase comparison relay – Fiber optic based relaying – SCADA architecture – Use of SCADA in interconnected power systems – PLC and DCS control.

UNIT V TESTING OF PROTECTIVE SYSTEMS AND ADAPTIVE PROTECTION 9

Testing of protective current and potential transformers – Testing of relays – primary and secondary injection tests – Relay burden – Relay setting – Relay co – ordination – Fault locators – Adaptive protection – Fault analysis – Adaptive techniques – Intelligent Electronics devices.

Lecture: 45, Tutorial: 0, Total: 45

REFERENCE BOOKS:

1. Y.G .Paithankar, S.R.Bhide, " Fundamentals of Power System Protection" . Prentice – Hall India, 2004
2. Badri Ram and D.N. Vishwakarma , " Power System Protection and Switch Gear" Tata McGraw Hill, New Delhi, 2003
3. RavindraP.Singh , " Digital Power System Protection" , PHI , New Delhi ,2007.
4. T.S.M.Rao , "Digital / Numerical Relays" Tata McGraw Hill ,2005.
5. Sunil S. Rao "Switch Gear and Protection", Khanna Publishers Delhi, 1998.
6. T.S. MadhavaRao , "Power System Protection Static Relays" , second Edition. Tata McGraw Hill, New Delhi.

P19PSE202 POWER SYSTEM DYNAMICS AND STABILITY 3 0 0 3

COURSE OUTCOMES:

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

1. Analyze the mathematical modeling and inductance calculations in synchronous machine.
2. Develop the transfer function model for excitation, speed governing and turbine systems.
3. Analyze the small signal stability of SMIB power systems.
4. Analyze the small signal stability of SMIB and Multimachine power systems with damping controllers.
5. Describe feedback controllers for small signal stability enhancement in power systems.

UNIT I SYNCHRONOUS MACHINE MODELLING 9

Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, Physical interpretation of dq0 transformation, Per Unit Representations- Power-invariant form of Park's transformation-Steady state analysis: Voltage, current and flux-linkage relationships- Computation of steady-state values.

UNIT II MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS 9

Elements of an Excitation System, Types of Excitation Systems- Modeling of Excitation system components, Modeling of IEEE type ST1A Excitation system model, Turbine and Governing System Modeling- Classical transfer function of a hydraulic turbine (no derivation), Special characteristics of hydraulic turbine, Electrical analog of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation,: Modeling of Single reheat tandem compounded type Steam Turbine.

UNIT III SMALL SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS 9

Classification of Stability- State- Space representation- Eigen properties of state matrix: Eigen values and Eigenvectors for stability, Participation factor. Single Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis- Effects of Field Circuit Dynamics- Block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability.

UNIT IV SMALL SIGNAL STABILITY ANALYSIS WITH CONTROLLERS 9

Effects of Excitation System: Thyristor Excitation System with AVR, Block diagram representation with Exciter and AVR, Effect of AVR on Synchronizing and Damping torque components, Power System Stabilizer: Block diagram representation with AVR and PSS, System state matrix including PSS- Small Signal Stability of Multi machine systems.

UNIT V ENHANCEMENT OF SMALL SIGNAL STABILITY 9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout and stabilizer gain – Stabilizer limits, Selection of PSS location.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCE BOOKS

1. Prabha Kundur, "Power System Stability and Control", Tata McGraw-Hill, 2014.
2. J.Machowski, Bialek, Bumby, " Power System Dynamics and Stability", John wiley and sons, 2011.
3. L.Leonard Grigsby, " Power System Stability and Control", CRC Press, 2017.
4. P.M Anderson and A.A Fouad, "Power System Control and Stability", Iowa State University Press, Ames, Iowa, 2008.
5. Peter W.Sauer&M.A.Pai, "Power System Dynamics & Stability", Pearson Education, 2006.

P19PSE203 RESTRUCTURED POWER SYSTEMS 3 0 0 3

COURSE OUTCOMES:

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

1. Understand the concepts of restructuring of power industry
2. Explain the basics of congestion management
3. Discuss about locational margin prices and financial 21 transmission rights
4. Explain the significance of ancillary services and pricing of transmission network
5. Elaborate the reforms of power sectors in India

UNIT I INTRODUCTION TO RESTRUCTURING OF POWER INDUSTRY 9

Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems – Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production – Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis – a – vis other commodities, Market architecture, Case study.

UNIT II TRANSMISSION CONGESTION MANAGEMENT 9

Introduction: Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management – Classification of congestion management methods – Calculation of ATC - Non – market methods – Market methods – Nodal pricing – Inter zonal and Intra zonal congestion management – Price area congestion management – Capacity alleviation method.

UNIT III LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHTS 9

Mathematical preliminaries: - Locational marginal pricing– Lossless DCOPF model for LMP calculation – Loss compensated DCOPF model for LMP calculation – ACOPF model for LMP calculation – Financial Transmission rights – Risk hedging functionality -Simultaneous feasibility test and revenue adequency – FTR issuance process: FTR auction, FTR allocation – Treatment of revenue shortfall – Secondary trading of FTRs – Flow gate rights – FTR and market power - FTR and merchant transmission investment.

UNIT IV ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK 9

Introduction of ancillary services – Types of Ancillary services – Classification of Ancillary services – Load generation balancing related services – Voltage control and reactive power support devices – Black start capability service - How to obtain ancillary service –Co- optimization of energy and reserve services - Transmission pricing – Principles – Classification – Rolled in transmission pricing methods – Marginal transmission pricing paradigm – Composite pricing paradigm – Merits and demerits of different paradigm.

UNIT V REFORMS IN INDIAN POWER SECTOR 9

Introduction – Framework of Indian power sector – Reform initiatives - Availability based tariff – Electricity act 2003 – Open access issues – Power exchange – Reforms in the near future

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCES

1. Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker, "Restructured electrical power systems: operation, trading and volatility" CRC Press, 2001.
2. Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, "Operation of restructured power systems", Kluwer Academic, 2001.
3. Paranjothi, S.R. , "Modern Power Systems" Paranjothi, S.R. , New Age International, 2017.
4. Sally Hunt," Making competition work in electricity", John Willey and Sons Inc, 2002.
5. Steven Stoft, "Power system economics: designing markets for electricity", John wiley and sons 2002.

P19PSE506 **SMART GRID** **3 0 0 3**

COURSE OUTCOMES:

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

1. Distinguish between smart grid and conventional grid.
2. Apply smart metering concepts to industrial and commercial installations.
3. Apply modern communication technologies for smart grid solutions.
4. Explain about the microgrid renewable energy systems.
5. Formulate solutions for the power quality issues in smart grid.

UNIT I INTRODUCTION 9

Introduction to Smart Grid - Evolution of Electric Grid - Concept of Smart Grid, Definitions, Need of Smart Grid- Concept of Robust &Self-Healing Grid - Present development & International policies in Smart Grid.

UNIT II SENSING, MEASUREMENTS, CONTROL AND AUTOMATION TECHNOLOGIES 9

Introduction to Smart Meters, Real Time Prizing, Smart Appliances - Automatic Meter Reading (AMR) - Outage Management System (OMS) - Plug in Hybrid Electric Vehicles(PHEV) - Vehicle to Grid, Smart Sensors - Home & Building Automation, Smart Substations, Substation Automation, Feeder Automation

UNIT III COMMUNICATION TECHNOLOGIES 9

Home Area Network (HAN) - Neighbourhood Area Network (NAN), Wide Area Network (WAN) - Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication - Wireless Mesh Network.Basics of CLOUD Computing &Cyber Security for Smart Grid - Broadband over Power line (BPL). IP based protocols

UNIT IV RENEWABLE ENERGY SYSTEMS AND MICROGRID 9

Plastic & Organic solar cells, Thin film solar cells - speed wind generators, fuel-cells, micro-turbines.
Smart storage like Battery, SMES, Pumped Hydro - Compressed Air Energy Storage - Concept of micro-grid, need & applications of micro-grid - Formation of micro-grid, Issues of interconnection - Protection & control of micro-grid

UNIT V POWER QUALITY IN SMART GRID 9

Power Quality issues of Grid connected Renewable Energy Sources -Power Quality Conditioners for Smart Grid - Web based Power Quality monitoring, Power Quality Audit.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCES

1. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, "Smart Grid: Technology and Applications", Wiley 2012.
3. Stuart Borlase, "Smart Grid: Infrastructure, Technology and solutions "CRC Press, 1st edition, 2012.
4. A.G.Phadke , "Synchronized Phasor Measurement and their Applications", Springer, 2nd edition, 2017.

P19PSE508 ARTIFICIAL INTELLIGENCE APPLICABLE TO POWER SYSTEMS 3 0 0 3

COURSE OUTCOMES:

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

1. Model and design the Fuzzy Logic Controller.
2. Describe in-depth knowledge on basic concepts and different learning methods of Artificial Neural Networks.
3. Model and design inference systems of Neuro fuzzy Controllers.
4. Describe the impart in-depth knowledge on basics and design issues of different genetic algorithms.
5. Apply fuzzy logic, Neural Network and Genetic Algorithm for power system problems.

UNIT I FUZZY LOGIC 9

Introduction to Artificial Intelligence, Classic set-Fuzzy set theory–Basic Definition and Terminology-Set Theoretic operations and properties- Membership function-Linguistic variable-Formation of fuzzy IF-THEN rules -Fuzzy inference- Design of fuzzy logic controller-Defuzzification methods.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Introduction Models of Neuron Network – Architectures – Knowledge representation – Artificial Intelligence and Neural networks–Learning process – Error correction learning – Hebbian learning – Competitive learning – Boltzman learning –Supervised learning – Unsupervised learning – Reinforcement learning – learning tasks- Multi – layer perceptron using Back propagation Algorithm (BPA) – Self – Organizing Map (SOM)–– Radial Basis Function Network – Functional Link Network (FLN) – Hopfield Network.

UNIT III NEURO-FUZZY 9

Neuro Fuzzy Modeling - Adaptive Neuro fuzzy Inference Systems- Neuro fuzzy controllers.

UNIT IV GENETIC ALGORITHMS 9

Genetic Algorithms: Introduction–Encoding – Fitness Function–Reproduction operators–Genetic Modeling – Genetic operators–Cross over – Single site cross over – Two point cross over – Multi point cross over – Uniform cross over – Matrix cross over–Cross over Rate –Inversion & Deletion – Mutation operator – Mutation – Mutation Rate–Bit–wise operators –Generational cycle – convergence of Genetic Algorithm-Hybrid Approach-Neuro-Genetic Hybrid and Fuzzy-Genetic Hybrid

UNIT V APPLICATIONS 9

Load forecasting Load frequency control -Economic Load Dispatch- Unit Commitment- Power system Stabilizer- Reactive power control – speed control of DC and AC Motors- Stability studies.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCE BOOKS:

1. S. Rajasekaran and G. A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic & Genetic Algorithms", Prentice-Hall India, 2003.
2. David. E. Goldberg, "Genetic Algorithms", Pearson Education, 2003.
3. J.S.R.Jang, C.T.Sun, and E. Mizutani, "Neuro-fuzzy and soft computing ", Prentice-Hall of India, pvt .Ltd 1997.
4. Fausett Laurence, "Fundamentals of Neural Networks", Pearson Education, New Delhi, 2004.
5. Dirankov .D, Hellendoorn .H and Reinfrank. M, "An Introduction to Fuzzy Control", Narosa Publishing House, New Delhi, 2001.
6. B.Yegnanarayana, "Artificial Neural Networks", Prentice Hall of India Pvt.Ltd, 2004.
7. Randy L. Haupt, Sue Ellen Haupt, "Practical Genetic Algorithm" ,John Wiley & sons, 2004

REFERENCE JOURNALS

1. IEEE Transactions on Fuzzy Systems.
2. IEEE Transactions on Neural Networks.
3. IEEE Transactions on Industrial Applications.
4. IEEE Transactions on Industrial Electronics.
5. IEEE Transactions on Power Systems.
6. IEEE Transactions on Power Delivery.

P19PSE204 POWER ELECTRONICS APPLIED TO POWER SYSTEMS LABORATORY 0 0 4 2

COURSE OUTCOMES:

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

1. Analyze the small signal stability of single machine and multi machine models.
2. Analyze the effect of FACTS controllers by performing steady state analysis.
3. Analyze the concepts in different wind energy conversion technologies.

LIST OF EXPERIMENTS

1. Small-signal stability analysis of single machine-infinite bus system using classical machine model
2. Small-signal stability analysis of multi-machine configuration with classical machine model
3. Load flow analysis of two-bus system with STATCOM
4. Transient analysis of two-bus system with STATCOM
5. Available Transfer Capability calculation using an existing load flow program
6. Modeling and simulation of variable speed wind energy conversion system- DFIG
7. Modeling and simulation of variable speed wind energy conversion system- PMSG
8. Simulation of MOSFET, IGBT based Choppers
9. Simulation of IGBT based Single phase inverters
10. Simulation of single phase AC voltage controller

Total Hours : 60

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Electronics and Communication Engineering
Branch: M.E. VLSI Design

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19VLD201	Low Power VLSI Design	3	0	0	3
2	P19VLD202	VLSI for Signal Processing	3	0	0	3
3	P15VLD203	Design for Testability	3	0	0	3
4	P19VLD504	**Elective -** Computer Aided Design of VLSI Circuits	3	0	0	3
5	P19VLD505	**Elective -** Computer Architecture And Parallel Processing	3	0	0	3
6	P19VLD507	**Elective -** Image Analysis and Computer Vision	3	0	0	3
7	P19GE701	**Audit Course** - English for Research Paper Writing	2	0	0	0
Practical						
8	P15VLD204	VLSI Design and Testing Laboratory	0	0	2	1
					Total Credits	**19**

Approved by

Chairman, Electronics and Communication Engineering BOS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ECE, Second Semester ME VLSI Students and Staff, COE

P19VLD201 LOW POWER VLSI DESIGN 3 0 0 3

COURSE OUTCOMES

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

1.Evaluate about the sources of power consumption in CMOS and hierarchy of limits
2. Calculate the power estimation in CMOS at logic level and circuit level.
3. Analyze the synthesis and software design for low power.
4. Analyze the SOI CMOS Devices.
5. Design SOI CMOS digital and analog circuits.

UNIT I : POWER DISSIPATION IN CMOS **09**

Introduction – Sources of Power Dissipation – Designing for Low power – Physics of Power Dissipation in MOSFET Devices – Power Dissipation in CMOS – Hierarchy of Limits of Power – Fundamental-Material- Device-Circuit and System limits.

UNIT II : POWER ESTIMATION **09**

Modeling of Signals – Signal Probability Calculation – Probabilistic Techniques for Signal Activity Estimation – Statistical Techniques – Estimation of Glitching Power – Sensitivity Analysis – Power Estimation Using Input Vector Compaction – Power Dissipation in Domino CMOS – Circuit Reliability – Power Estimation at the Circuit Level – High Level Power Estimation – Information-Theory-Based Approaches – Estimation of Maximum power.

UNIT III : SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER **09**

Behavioral Level Transforms – Logic Level Optimization for Low power – Circuit Level – Sources of Software Power Dissipation – Software Power Estimation – Software Power Optimizations – Automated Low-Power Code Generation – Co-design for Low Power.

UNIT IV: SOI CMOS DEVICE **09**

Introduction – Basic SOI Technology – Back Gate Bias Effects – Short Channel Effects – Narrow Channel Effects – Mobility – Floating Body Effects – Subthreshold Behavior – Impact Ionization – Breakdown – Transient-Induced Leakage – Self-Heating – Hot Carriers – Accumulation-Mode Devices.

UNIT V: SOI CMOS DIGITAL AND ANALOG CIRCUITS **09**

Static and Dynamic Logic Circuits – DRAM – SRAM – CAM – Gate Array – CPU – Multiplier and DSP – Frequency Divider – SOI Op Amps – Filters – ADC and DAC – Sigma – Delta ADC – RF Circuits Sigma – Low Noise Amplifier – Mixer – Voltage Controlled Oscillator.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCE BOOKS

1 Roy K. and Prasad S.C. , "*Low Power CMOS VLSI circuit design,"* Wiley,2011.

2 James B. Kuo, Shin chia Lin, *"Low voltage SOI CMOS VLSI Devices and Circuits"*, John Wiley and sons, inc 2008.

3 DimitriosSoudris, ChirstianPignet, Costas Goutis, "*Designing CMOS Circuits For Low Power"*, Kluwer,2010.

4 Kuo J.B and Lou J.H, "*Low voltage CMOS VLSI Circuits"*, Wiley 2017

P19VLD202 **VLSI FOR SIGNAL PROCESSING** **3 0 0 3**

COURSE OUTCOMES

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

1. Develop different algorithm for DSP systems and discuss about the pipelining and parallel processing.
2. Analyze the different techniques of retiming, folding and unfolding.
3. Design IIR filters for fast convolution, pipelining and parallel processing.
4. Design the different types of multipliers and CSD Representation of VLSI systems.
5. Apply synchronous and asynchronous pipelining in DSP Processors.

UNIT I : INTRODUCTION TO DSP SYSTEMS **09**

Introduction to DSP Systems –Typical DSP Algorithms – Iteration Bound – Data Flow Graph Representations – Loop Bound and Iteration Bound – Algorithms for Computing Iteration Bound – Pipelining and Parallel Processing –Pipelining of FIR Digital Filters – Parallel Processing – Pipelining and Parallel Processing for Low Power.

UNIT II : RETIMING, FOLDING AND UNFOLDING **09**

Retiming – Definitions and Properties – Retiming Techniques – Unfolding – an Algorithm for Unfolding – Properties of Unfolding –Applications – Sampling Period Reduction – Parallel Processing –Folding – Folding Transformation – Register Minimizing Techniques – Register Minimization in Folded Architectures.

UNIT III: FAST CONVOLUTION **09**

Fast Convolution – Cook-Toom Algorithm –modified Cook-Toom algorithm– Pipelined and parallel recursive filters – Look-Ahead pipelining in first-order IIR filters, Look-Ahead pipelining with powerof-2 decomposition, Clustered look-ahead pipelining, Parallel processing of IIR filters, combined pipelining and parallel processing of IIR filters.

UNIT IV: BIT-LEVEL ARITHMETIC ARCHITECTURES **09**

Bit-Level Arithmetic Architectures – Parallel Multipliers – Baugh-Wooley Multipliers – Interleaved Floor – Plan and Bit-Plane – Based Digital Filters – Design of Lyon's Bit-Serial Multipliers using Horner's Rule – Bit-Serial FIR Filter –CSD Representation – CSD Multiplication using Horner's Rule for Precision Improvement – Distributed Arithmetic.

UNIT V : PROGRAMMING DIGITAL SIGNAL PROCESSORS **09**

Synchronous – Wave and Asynchronous Pipelining – Synchronous Pipelining and Clocking Styles – Clock Skew and Clock Distribution in Bit-Level Pipelined VLSI Designs –Wave Pipelining – Asynchronous Pipelining – Programming Digital Signal Processors – General Architecture with Important Features.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCE BOOKS

1. Keshab K. Parhi, " *VLSI Digital Signal Processing Systems*", Design and implementation , Wiley, Interscience, 2007
2. U. Meyer – Baese, " *Digital Signal Processing with Field Programmable Gate Arrays*", Springer, Indian Reprint, 2014

P15VLD203 **DESIGN FOR TESTABILITY** **3 0 0 3**

COURSE OUTCOMES

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

1. Analyze the modeling of faults and types of simulation for testing circuits and systems.
2. Design and analyze test generation of combinational circuits and testable designs.
3. Design and analyze test generation of sequential circuits and testable designs.
4. Design and evaluate the test pattern generation of Built In Self Test.
5. Synthesize and analyze different fault diagnosis in combinational and sequential circuits.

UNIT I : TESTING AND FAULT MODELLING **09**

Introduction to Testing – Faults in Digital Circuits – Modeling of Faults – Logical Fault Models – Fault Detection and Redundancy – Fault Equivalence and Fault Location – Fault Dominance – Logic Simulation – Types of Simulation – Compiled Simulation – Event Driven Simulation – Delay Models – Gate Level Event-Driven Simulation.

UNIT II : TEST GENERATION OF COMBINATIONAL CIRCUITS **09**

Test Generation of Combinational Logic Circuits – One Dimensional Path Sensitization – Boolean Difference – D-Algorithm – Path Oriented Decision Making – Detection of Multiple Faults in Combinational Logic Circuits – Testable Combinational Logic Circuit Design –The Reed-Muller Expansion Techniques – Three Level OR- AND - OR Design – Use of Control Logic – Syndrome Testable Design.

UNIT III : TEST GENERATION OF SEQUENTIAL CIRCUITS **09**

Test Generation of Sequential Circuits – Testing of Sequential Circuits as Iterative Combinational Circuits – State Table Verification – Random Testing – Transition Count Testing – Signature Analysis – Design of Testable Sequential Circuits – Scan Path Technique – Level Sensitive Scan Design – Random Access Scan Technique.

UNIT IV : BUILT IN SELF – TEST **09**

Introduction – Test Pattern Generation for BIST – Exhaustive Testing – Pseudorandom Testing – Pseudo-Exhaustive Testing – Specific BIST Architectures – Built In Evaluation and Self Test – Random Test Socket – LSSD on Chip Self Test – Self-Testing Using MISR and Parallel SRSG – Concurrent BIST Architecture – Random Test Data – Circular Self Test Path – Built In Logic Block Observation.

UNIT V : FAULT DIAGNOSIS **09**

Logic Level Diagnosis – Fault Dictionary- Guided Probe Testing – Diagnosis by UUT Reduction – Fault Diagnosis for Combinational Circuits – Expert Systems for Diagnosis – Effect Cause Analysis – Self Checking Design – Application of Error Detecting and Error Correcting Codes – Multiple Bit Errors – Checking Circuits and Self Checking – Self Checking Checkers – Parity Check Function – Totally Self Checking Checkers.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCE BOOKS

1. Parag K. Lala, "*Fault Tolerant and Fault Testable Hardware Design*", BS Publications, 2009.
2. Abramovici M, Breuer M.A. and Friedman A.D., "*Digital Systems and Testable Design*", Jaico Publishing House, 2004.
3. Bushnell M.L and Agrawal V. D., "*Essentials of Electronic Testing for Digital*", Memory and Mixed-Signal VLSI Circuit", Kluwar Academic Publishers, 2009.
4. Crouch A.L,"*Design for Test for Digital IC's and Embedded Core System*", Prentice Hall International, 2002.

P19VLD504 COMPUTER AIDED DESIGN OF VLSI CIRCUITS 3 0 0 3

COURSE OUTCOMES

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

1. Analyze the VLSI design methodologies and algorithmic graph theory.
2. Analyze and illustrate layout design rules, placement and partitioning.
3. Design and analyze floor planning and routing concept.
4. Examine and verify the various modeling of simulation.
5. Analyze and illustrate synthesis and scheduling.

UNIT I : VLSI DESIGN METHODOLOGIES AND ALGORITHMIC GRAPHY THEORY 09

Introduction to VLSI Design Methodologies – VLSI Design Automation Tools – Algorithmic Graph Theory and Computational Complexity – Tractable and Intractable Problems – General Purpose Methods for Combinatorial Optimization

UNIT II : PLACEMENT AND PARTITIONING 09

Layout Compaction – Design Rules - Problem Formulation – Algorithms for Constraint Graph Compaction –Placement And Partitioning – Circuit Representation – Wire length Estimation– Placement Algorithms – Partitioning.

UNIT III : FLOORPLANNING AND ROUTING 09

Floor planning Concepts – Shape Functions and Floor Plan Sizing – Types of Local Routing Problems – Area Routing – Channel Routing – Global Routing – Algorithms for Global Routing.

UNIT IV : SIMULATION AND VERIFICATION 09

VLSI Simulation – Gate-Level Modeling And Simulation – Switch-Level Modeling and Simulation – Combinational Logic Synthesis – Binary Decision Diagrams – Two Level Logic Synthesis.

UNIT V : HIGH LEVEL SYNTHESIS 09

Hardware Models for High Level Synthesis – Internal Representation of the Input Algorithm– Allocation-Assignment and Scheduling – Scheduling Algorithm – Assignment problem – High Level Transformations.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCE BOOKS

1. Gerez S.H., "*Algorithms for VLSI Design Automation"*, John Wiley & Sons,2009.
2. Sherwani N.A., "*Algorithms for VLSI Physical Design Automation*"Kluwar Academic Publishers, 2013
3. Drechsler, R., "*Evolutionary Algorithms for VLSI CAD"*, Kluwer Academic Publishers, Boston, 2010.
4. Hill, D., Shugard D., Fishburn J. and Keutzer K., "*Algorithms and Techniques for VLSI Layout Synthesis"*, Kluwer Academic Publishers, Boston, 2011.

P19VLD505 COMPUTER ARCHITECTURE AND PARALLEL PROCESSING 3 0 0 3

COURSE OUTCOMES

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

1. Analyze the advanced concepts of parallel processing
2. Apply the memory hierarchy for multiprocessor system
3. Analyze the design structures of pipelined and multiprocessor systems
4. Analyze the system architecture with parallel, vector and scalable architecture for building high-performance computers
5. Apply the concept in parallel processing concept in various architecture

UNIT I : PRINCIPLES OF PARALLEL PROCESSING **09**

Multiprocessors and Multicomputers – Multivector and SIMD Computers – PRAM and VLSI Models – Conditions of Parallelism – Program Partitioning and Scheduling-Program Flow Mechanisms – Parallel Processing Applications – Speed Up Performance Law.

UNIT II : PROCESSOR AND MEMORY ORGANIZATION **09**

Advanced Processor Technology – Superscalar and Vector Processors – Memory Hierarchy Technology – Virtual Memory Technology – Cache Memory Organization – Shared Memory Organization.

UNIT III : PIPELINE AND PARALLEL ARCHITECTURE **09**

Linear Pipeline Processors – Non Linear Pipeline Processors – Instruction Pipeline Design –Arithmetic Design – Superscalar and Super Pipeline Design – Multiprocessor System Interconnects – Message Passing Mechanisms.

UNIT IV : VECTOR, MULTITHREAD AND DATAFLOW ARCHITECTURE **09**

Vector Processing Principle – Multi-Vector Multiprocessors – Compound Vector Processing- Principles of Multithreading – Fine Grain Multi-Computers – Scalable and Multithread Architectures – Dataflow and Hybrid Architectures

UNIT V : SOFTWARE AND PARALLEL PROCESSING **09**

Parallel Programming Models – Parallel Languages and Compilers – Parallel Programming Environments Synchronization and Multiprocessing Modes – Message Passing Program Development – Mapping Programs onto Multi Computers – Multiprocessor UNIX Design Goals – MACH/OS Kernel Architecture – OSF/1 Architecture and Applications.

Lecture: 45, Tutorial: 00, Total: 45 Hours

REFERENCE BOOKS

1. Kai Hwang, "*Advanced Computer Architecture*", TMH 2017, 3rd edition.
2. DezsoSima,TerenceFountain,Peter Kacsuk,"*AdvancedComputerarchitecture –A designSpaceApproach*" ,PearsonEducation,2003.
3. John P.Shen, "*Modern processor design. Fundamentals of super scalar processors*", Tata McGraw Hill 2013.
4. Harry F. Jordan Gita Alaghband, " *Fundamentals of parallel Processing*", Pearson Education , 2003
5. Richard Y.Kain, " *Advanced computer architecture –A systems Design Approach*", PHI, 2003
6. Quinn M.J, "*Designing efficient Algorithms for parallel computer*", McGraw Hill International, 1994.
7. William Stallings, "*Computer Organization and Architecture*", McMillan Publishing Company, 2013.

P19VLD507 IMAGE ANALYSIS AND COMPUTER VISION 3 0 0 3

COURSE OUTCOMES:

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

1. Implement image enhancement algorithms.
2. Apply image transforms for different image applications.
3. Perform different segmentation and restoration
4. Implement different compression techniques
5. Develop algorithms for computer vision problems.

UNIT 1 : IMAGE ENHANCEMENT 09

Digital Image fundamentals - Image sampling - Quantization - Spatial domain filtering - Image negative - Contrast stretching, Gray level slicing - Histogram equalization - Smoothing filters, Sharpening filters, Maximum filter, Minimum filter, Median filter.

UNIT II : IMAGE TRANSFORMS 09

2D transforms - DFT - DCT - Walsh - Hadamard - Slant - Haar - KLT - SVD - Wavelet transform.

UNIT III : IMAGE RESTORATION AND SEGMENTATION 09

Image restoration - degradation model - Unconstrained and Constrained restoration - Inverse filtering - Wiener filtering - Image segmentation - Thresholding - Edge detection - Region based segmentation.

UNIT IV : IMAGE COMPRESSION 06

Need for data compression - Huffman - Arithmetic coding - LZW technique - Vector Quantization - JPEG – MPEG

UNIT V : COMPUTER VISION 12

Texture classification - Feature extension - Markov Random Field Matrix – Gray Level Co –occurrence Matrix – Gray Level Weight Matrix , Multi Resolution Combined Statistical and Spatial Frequency method, character recognition-zoning approaches, Medical Image Analysis – Diabetic Retinopathy – Glaucoma.

REFERENCES:

1. Rafael C.Gonzalex, Richard E.Woods, "*Digital Image Processing, Pearson Education. Inc"*., Forth Edition, 2018.
2. Anil K.Jain, "*Fundamentals of Digital Image Processing*", Prentice Hall of India, 2004.
3. Milan Sonka, Vaclav Hlavac and Roger Boyle, "*Image Procesing, Analysis and Machine Vision*", Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.
4. Jayaraman S Esakkirajan and Veerakumar, "Digital Image Processing", McGraw Hill Education; July 2017
5. Sid Ahmed, M.A., "*Image Processing Theory, Algorithms and Architectures*", Mc Graw Hill, 1995.
6. Richard Szeliski, "*Computer Vision Algorithms and Applications*", Springer Verlag London Limited, 2011.
7. Sabeenian R.S., "*Digital Image Processing*", Sonaversity publication, Second Edition, 2010.
8. Annadurai S., R. Shanmugalakshmi, "*Fundamentals of Digital Image Processing*", Pearson Education India, 2007.
9. Sridhar.S, "*Digital Image Processing*", Oxford University Press, First Edition, 2011.
10. Kenneth R. Castleman, "*Digital Image Processing*", Pearson, 2009

P15VLD204 VLSI DESIGN AND TESTING LABORATORY 0 0 2 1

COURSE OUTCOMES

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

1. Design and simulate the performance analysis of source followers, and OP- AMPs, different types of current mirrors.
2. Design and simulate test and verification using system Verilog.
3. Implementation of the real time application using Embedded Microcontroller.

LIST OF EXPERIMENTS

1. Design and simulate frequency response and noise analysis of any Source followers.
2. Design and simulate operational amplifier performance parameters - One-stage Op Amps, Two-stage Op Amps.
3. Design and simulate cascode current mirrors and active current mirrors.
4. Design and implementation of BIT - SLICE using FPGA.
5. Design and Simulation of Gate-level modeling.
6. Design and Simulation of Switch-level modeling.
7. Verification of combinational circuits using system Verilog.
8. Verification of sequential circuits using system Verilog.
9. Implementation of Elevator controller using Embedded Microcontroller.
10. Implementation of model train controller using Embedded Microcontroller.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19CSE201	Advanced Databases	3	0	0	3
2	P19CSE202	Machine Learning	3	0	0	3
3	P19CSE507	**Elective** - Natural Language Processing	3	0	0	3
4	P19CSE508	**Elective** - Internet of Things	3	0	0	3
5	P19CSE510	**Elective** - Data Warehousing and Data Mining	3	0	0	3
6	P19GE701	**Audit Course** - English for Research Paper Writing	2	0	0	0
Practical						
7	P19CSE203	Advanced Database Laboratory	0	0	4	2
8	P19CSE204	Machine Learning Laboratory	0	0	4	2
					Total Credits	**19**

Approved by

Chairperson, Computer Science and Engineering BOS
Dr.B.Sathiyabhama

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/CSE, Second Semester ME CSE Students and Staff, COE

P19CSE201	ADVANCED DATABASES	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

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

- Comprehend the various database revolution
- Work with NoSQL databases to analyze the big data for useful business Applications
- Analyze the different data models based on data representation methods and storage needs
- Design and develop using application programming interface with SQL and NoSQL databases
- Discover the survey on future generation databases

UNIT I

Introduction **9**

Database Revolutions- System Architecture- Relational Database- Database Design Data Storage- Transaction Management- Data warehouse and Data Mining- Information Retrieval

UNIT II

Document Databases **9**

Big Data Revolution- CAP Theorem- Birth of NoSQL- Document Database—XML Databases- JSON Document Databases- Graph Databases. Column Databases— Data Warehousing Schemes- Columnar Alternative- Sybase IQ- C-store and Vertica- Column Database Architectures- SSD and In-Memory Databases— In Memory Databases- Berkeley Analytics Data Stack and Spark.

UNIT III

Distributed Database Patterns **9**

Distributed Relational Databases- Non-relational Distributed Databases- MongoDB - Sharing and Replication- HBase- Cassandra Consistency Models— Types of Consistency- Consistency MongoDB- HBase Consistency- Cassandra Consistency**.**

UNIT IV

Data Models and Storage **9**

SQL- NoSQL APIs- Return SQL- Advance Databases-PostgreSQL- Riak-HBase-MongoDB-Cassandra Query Language-MapReduce-Pig-DAG-Cascading-Spark- CouchDB- NEO4J- Redis

UNIT V

Future Databases **9**

Database of Future-Key value database-Distrubutive transaction-Other Convergent Databases- Disruptive Database Technologies-Storage Technologies-BlockChain-Quantum Computing

Total: 45

REFERENCE BOOKS

1) Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System
2) Concepts", Sixth Edition, McGrawHill
3) Guy Harrison, "Next Generation Databases", Apress, 2015.
4) Eric Redmond, Jim R Wilson, "Seven Databases in Seven Weeks", LLC. 2012
5) Dan Sullivan, "NoSQL for Mere Mortals", Addison-Wesley, 2015
6) Adam Fowler, "NoSQL for Dummies ", John Wiley & Sons, 2015

P19CSE202	MACHINE LEARNING	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

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

- Comprehend machine learning basics
- Implement supervised learning algorithms for the given application and analyze the results
- Use tools to implement typical clustering algorithms for different types of applications
- Design and implement an HMM for a sequence model type of application
- Comprehend the advanced learning algorithms and identify the suitable applications for solving using these advanced learning techniques

UNIT I **9**

INTRODUCTION

Machine Learning -Machine Learning Foundations –Overview –Design of a Learning system - Types of machine learning –Applications Mathematical foundations of machine learning -random variables and probabilities -Probability Theory –Probability distributions -Decision Theory-Bayes Decision Theory - Information Theory

UNIT II

SUPERVISED LEARNING **9**

Linear Models for Regression -Linear Models for Classification –Naïve Bayes -Discriminant Functions - Probabilistic Generative Models -Probabilistic Discriminative Models -Bayesian Logistic Regression. Decision Trees -Classification Trees-egression Trees -Pruning. Neural Networks -Feed-forward Network Functions - Back-propagation. Support vector machines -Ensemble methods-Bagging-Boosting.

UNIT III

UNSUPERVISED LEARNING **9**

Clustering-K-means -EM Algorithm-Mixtures of Gaussians. The Curse of Dimensionality -Dimensionality Reduction -Factor analysis -Principal Component Analysis -Probabilistic PCA-Independent components analysis**.**

UNIT IV

PROBABILISTIC GRAPHICAL MODELS **9**

Graphical Models -Undirected graphical models-Markov Random Fields -Directed Graphical Models -Bayesian Networks -Conditional independence properties -Inference –Learning-Generalization -Hidden Markov Models - Conditional random fields(CRFs).

UNIT V **9**

ADVANCED LEARNING

Sampling –Basic sampling methods –Monte Carlo. Reinforcement Learning-K-Armed Bandit-Elements - Model-Based Learning-Value Iteration-Policy Iteration. Temporal Difference Learning-Exploration Strategies-Deterministic and Non-deterministic Rewards and Actions Computational Learning Theory -Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting

Total: 45

REFERENCE BOOKS

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. EthemAlpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
4. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman,”Mining of Massive Datasets”, Cambridge University Press, Second Edition.
5. 2016Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.
7. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Chapman and Hall/CRC Press, Second Edition, 2014

P19CSE204 MACHINE LEARNING LABORATORY

L	T	P	C	Marks
0	0	4	2	100

COURSE OUTCOMES

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

- Understand the implementation procedures for the machine learning algorithms
- Solve the problems using machine learning techniques in image and language processing applications
- Choose appropriate algorithms/ techniques to solve computing problems in real-world.

List of Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs
11. Case Study on google Colab

P19CSE507 NATURAL LANGUAGE PROCESSING

L	T	P	C	Marks
3	0	0	3	100

COURSE OUTCOMES

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

- Compare the various models in morphology
- Analyze the various techniques used in syntactic analysis
- Compare the various parsing techniques in context free grammar
- Analyze the various the semantic analysis techniques
- Analyze the various techniques for language generation and disclosure analysis

UNIT I

OVERVIEW AND MORPHOLOGY **9**

Introduction – Models -and Algorithms - -Regular Expressions Basic Regular Expression Patterns – Finite State Automata. Morphology -Inflectional Morphology - Derivational Morphology. Finite-State Morphological Parsing --Porter Stemmer

UNIT II

WORD LEVEL AND SYNTACTIC ANALYSIS **9**

N-grams Models of Syntax - Counting Words - Unsmoothed N-grams. Smoothing- Backoff Deleted Interpolation – Entropy - English Word Classes - Tagsets for English. Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging

UNIT III

CONTEXT FREE GRAMMARS **9**

Context Free Grammars for English Syntax- Context-Free Rules and Trees. Sentence- Level Constructions– Agreement – Sub Categorization. Parsing – Top-down – Earley Parsing -feature Structures – Probabilistic Context-Free Grammars

UNIT IV

SEMANTIC ANALYSIS **9**

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus. Representing Linguistically Relevant Concepts -Syntax-Driven Semantic Analysis - Semantic Attachments -Syntax-Driven Analyzer. Robust Analysis - Lexemes and Their Senses - Internal Structure -Word Sense Disambiguation - Information Retrieval

UNIT V **9**

LANGUAGE GENERATION AND DISCOURSE ANALYSIS

Discourse -Reference Resolution - Text Coherence -Discourse Structure – Coherence. Dialog and Conversational Agents - Dialog Acts – Interpretation -Conversational Agents. Language Generation –

Architecture -Surface Realizations - Discourse Planning. Machine Translation -Transfer Metaphor–Interlingua – Statistical Approaches

Total: 45

REFERENCE BOOKS

1. Gerald J. Kowalski , Mark T. Maybury , " Information Storage And Retrieval Systems Theory and Implementation", Second Edition , Kluwer Academic Publishers
2. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008
3. C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA:,1999
4. Tomek Strzalkowski " Natural Language Information Retrieval ", Kluwer academic Publishers,1999

P19CSE508	INTERNET OF THINGS	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

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

- Appreciate the evolution and applications of IoT
- Identify suitable/appropriate sensors for an application and understand circuits
- Analyze different options for Embedded systems, connectivity and networking protocol and apply the appropriate one for a given application
- Examine the important aspects of IoT architectures and write programs for Arduino and Raspberry Pi
- Identify the security issue and solve the issues

UNIT I **9**

IOT – MOTIVATION AND APPLICATIONS

Importance of IoT. Motivating Applications of IoT: Smart Cities- Smart Waste Management, Smart Street Lights, Smart Street Parking, Security without Surveillance, Connected Vehicles. Healthcare- Baby Monitoring, Elderly Monitoring, Mood Enhancing, Disease Treatment and Progression Monitoring, Enhance Adherence, Challenges. Agriculture- Precision Agriculture, Connected Livestock, Food Safety. Manufacturing and Logistics- Smart Manufacturing- Smart Packaging, Smart Label. Smart Electricity Grid- Managing Supply and Demand. Home Automation**.**

UNIT II

SENSORS AND CIRCUITS **8**

Sensor – Introduction, Terminology, Behavior, Selection,Circuits – Overview and Applications, Battery Issue and Energy Management, Wireless Link, Digital and Analog – Digital Computing, Analog to Digital Interfaces

UNIT III **9**

EMBEDDED SYSTEMS, CONNECTIVITY AND NETWORKING

Embedded Systems – Overview, Technology Drivers, Energy, Microcontrollers, Software Connectivity and Networking – Introduction, Connectivity Challenges in IoT, Energy Harvesting Transmitters, Massive Multiple Access, Computation vs Communication

UNIT IV

ARCHITECTURE AND PROGRAMMING **9**

IoT Architectures – embedded System, Gateway and Cloud (MGC) Architecture and other reference models and architectures Arduino vs Raspberry Pi vs Electric Imp – Key features and comparisons Arduino Interfaces – Arduino IDE – Programming

UNIT V **10**

IOT CHALLENGES AND SECURITY STANDARDS

Technology Challenges – Security, Connectivity, Compatibility and Longevity, Standards, Intelligent Analysis and Actions .IoT Society Challenges – Privacy, Regulatory Standards -IoT security lifecycle - Cloud services and IoT – offerings related to IoT from cloud service providers – Cloud IoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing

Total: 45

REFERENCE BOOKS

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley & Sons Ltd., UK, 2014.
3. "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press)
4. Dieter Uckelmann, Mark Harrison and Florian Michahelles, “Architecting the Internet of Things”, Springer, NewYork, 2011
5. Olivier Hersent, David Boswarthick and OmarElloumi, “The Internet of Things: Key Applications and Protocols”, John Wiley & Sons Ltd., UK, 2012.
6. B. Rusell and D. Van Duren, “Practical Internet of Things Security,” Packet Publishing, 2016.

P19CSE510 DATA WAREHOUSING AND DATA MINING

L	T	P	C	Marks
3	0	0	3	100

COURSE OUTCOMES

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

- Describe the role of statistics in data mining and identify a suitable mining technique to solve the given problem
- Identify and apply various data preprocessing techniques to improve data quality
- Analyze various classifications and clustering methods
- Apply OLAP operations to query processing in data mining
- Apply various mining techniques to developing areas-Web mining, Text mining and social networks and time series data

UNIT I

INTRODUCTION **9**

Relation to Statistics, Databases- Data Mining Functionalities-Steps in Data Mining Process-Architecture of a Typical Data Mining Systems- Classification of Data Mining Systems - Overview of Data Mining Techniques-Issues

UNIT II

DATA PREPROCESSING AND ASSOCIATION RULES **9**

Data Preprocessing-Data Cleaning, Integration, Transformation, Reduction, and Discretization Concept Hierarchies- Concept Description: Data Generalization And Summarization Based Characterization- Mining Association Rules In Large Databases – Analysis of Attribute Relevance- Exploratory Data Analysis Using tools(Python, Weka and R).

UNIT III

PREDICTIVE MODELING **9**

Classification and Prediction: Issues Regarding Classification and Prediction-Classification By Decision Tree Induction-Bayesian Classification-Classification by Back Propagation - Other Classification Methods-Prediction- Clusters Analysis: Types Of Data In Cluster Analysis- Categorization Of Major Clustering Methods: Partitioning Methods –Hierarchical Methods – Density Based Methods – Grid Based – Model Based – Outlier Analysis- Case Studies using tools(Python, Weka and R)

UNIT IV

DATA WAREHOUSING **9**

Data Warehousing Components -Multi Dimensional Data Model- Data Warehouse Architecture-Data Warehouse Implementation- -Mapping the Data Warehouse to Multiprocessor Architecture- OLAP Need-Categorization of OLAP Tools – OLAP Operations in Multidimensional Data Model

UNIT V

APPLICATIONS **9**

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis-Web Mining- Sentimental Analysis-Mining Multimedia data on the Web, Automatic classification of Web documents- Mining Time Series data and Sequential Pattern Mining

Total: 45

REFERENCE BOOKS

1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2002.
2. Alex Berson,Stephen J. Smith, “Data Warehousing, Data Mining,& OLAP”, Tata Mcgraw- Hill, 2004.
3. Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth And Ramasamy Uthurusamy, "Advances In Knowledge Discovery And Data Mining", The M.I.T Press, 1996.
4. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
5. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997.
6. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
7. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman,”Mining of Massive Datasets”, Cambridge University Press, Second Edition,2016
8. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

P19CSE203	ADVANCED DATABASES LABORATORY	L	T	P	C	Marks
		0	0	4	2	100

COURSE OUTCOMES

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

- Create and work on distributed, object oriented and parallel databases
- Experiment on active and deductive database
- Design the database using XML for real time application

List of Experiments:

1. Distributed Database design for real time application
2. Deadlock Detection Algorithm for distributed database using wait- for graph
3. Experiment using Object Oriented Database – Extended Entity Relationship (EER)
4. Design Parallel Database for real time application
5. Parallel Database – Implementation of Parallel Join and Parallel Sort
6. Active Database – Implementation of Triggers & Assertions for Bank Database
7. Model building and interpretation of results using WEKA tool
8. Implementation of an Efficient Query Optimization
9. Designing XML Schema for a given database
10. Integrate Node.js with SQL Database (MySQL/PostgreSQL/Oracle)
11. Integrate Node.js with No SQL Database (MongoDB/Cassandra)

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Computer Science and Engineering
Branch: M.Tech Data Science

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19MDS201	Machine Learning	3	0	0	3
2	P19MDS202	Data Visualization	3	0	0	3
3	P19MDS512	**Elective** - Internet of Things	3	0	0	3
4	P19MDS513	**Elective** - Data Warehousing and Data Mining	3	0	0	3
5	P19MDS514	**Elective** - Information Retrieval Techniques	3	0	0	3
6	P19GE701	**Audit Course** - English for Research Paper Writing	2	0	0	0
Practical						
7	P19MDS203	Machine Learning Laboratory	0	0	4	2
8	P19MDS204	Data Visualization Laboratory	0	0	4	2
					Total Credits	**19**

Approved by

Chairperson, Computer Science and Engineering BOS
Dr.B.Sathiyabhama

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/CSE, Second Semester M.Tech DS Students and Staff, COE

P19MDS201	MACHINE LEARNING	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

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

- Comprehend machine learning basics
- Implement supervised learning algorithms for the given application and analyze the results
- Use tools to implement typical clustering algorithms for different types of applications
- Design and implement an HMM for a sequence model type of application
- Comprehend the advanced learning algorithms and identify the suitable applications for solving using these advanced learning techniques

UNIT I **9**

INTRODUCTION

Machine Learning -Machine Learning Foundations –Overview –Design of a Learning system -Types of machine learning –Applications Mathematical foundations of machine learning -random variables and probabilities -Probability Theory –Probability distributions -Decision Theory-Bayes Decision Theory - Information Theory

UNIT II **9**

SUPERVISED LEARNING

Linear Models for Regression -Linear Models for Classification –Naïve Bayes -Discriminant Functions - Probabilistic Generative Models -Probabilistic Discriminative Models -Bayesian Logistic Regression. Decision Trees -Classification Trees-egression Trees -Pruning. Neural Networks -Feed-forward Network Functions - Back-propagation. Support vector machines -Ensemble methods-Bagging-Boosting

UNIT III **9**

UNSUPERVISED LEARNING

Clustering-K-means -EM Algorithm-Mixtures of Gaussians. The Curse of Dimensionality -Dimensionality Reduction -Factor analysis -Principal Component Analysis -Probabilistic PCA-Independent components analysis

UNIT IV **9**

PROBABILISTIC GRAPHICAL MODELS

Graphical Models -Undirected graphical models-Markov Random Fields -Directed Graphical Models -Bayesian Networks -Conditional independence properties -Inference –Learning-Generalization -Hidden Markov Models - Conditional random fields(CRFs).

UNIT V **9**

ADVANCED LEARNING

Sampling –Basic sampling methods –Monte Carlo. Reinforcement Learning-K-Armed Bandit-Elements - Model-Based Learning-Value Iteration-Policy Iteration. Temporal Difference Learning-Exploration Strategies-Deterministic and Non-deterministic Rewards and Actions Computational Learning Theory -Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting

Total: 45

REFERENCE BOOKS

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. EthemAlpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014
4. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman,”Mining of Massive Datasets”, Cambridge University Press, Second Edition.
5. 2016Tom Mitchell, "Machine Learning", McGraw-Hill, 1997
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.
7. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Chapman and Hall/CRC Press, Second Edition, 2014

P19MDS202	DATAVISUALIZATION	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

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

- Comprehend the skills required for visual analysis
- Analyze various patterns in Data visualization
- Apply visualization techniques for various data analysis tasks
- Design information dashboard with required components
- Analyze critical design practices in real time application development

UNIT I **9**

CORE SKILLS FOR VISUAL ANALYSIS

Information visualization – effective data analysis – traits of meaningful data – visual perception –making abstract data visible – building blocks of information visualization – analytical interaction – analytical navigation – optimal quantitative scales – reference lines and regions – trellises and crosstabs – multiple concurrent views – focus and context – details on demand – over-plotting reduction – analytical patterns – pattern examples

UNIT II **9**

TIME-SERIES, RANKING, AND DEVIATION ANALYSIS

Time-series analysis – time-series patterns – time-series displays – time-series best practices – part-to-whole and ranking patterns – part-to-whole and ranking displays – best practices – deviation analysis – deviation analysis displays – deviation analysis best practices.

UNIT III **9**

DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS

Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques and best practices-Exploratory data Analysis

UNIT IV **9**

INFORMATION DASHBOARD DESIGN

Information dashboard – Introduction– dashboard design issues and assessment of needs – Considerations for designing dashboard-visual perception – Achieving eloquence

UNIT V **9**

DASHBOARD DESIGN MEDIA

Advantages of Graphics _Library of Graphs – Designing Bullet Graphs – Designing Sparklines – Dashboard Display Media –Critical Design Practices – Putting it all together Unveiling the dashboard-Case Study-Tableau

Total: 45

REFERENCES

1. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008
2. Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.
3. Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011
4. Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.
5. Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010
6. Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013

P19MDS203	MACHINE LEARNING LABORAT ORY	L	T	P	C	Marks
		0	0	4	2	100

COURSE OUTCOMES

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

- Understand the implementation procedures for the machine learning algorithms
- Solve the problems using machine learning techniques in image and language processing applications
- Choose appropriate algorithms/ techniques to solve computing problems in real-world

List of Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs
11. Case Study on google Colab

P19MDS204	DATA VISUALIZATION LABORATORY	L	T	P	C	Marks
		0	0	4	2	100

Course outcomes

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

- Present data with visual representations for your target audience, task, and data
- Identify appropriate data visualization techniques like deviation, correlation, ranking for the given particular requirements imposed by the data
- Analyze and design appropriate principles for creating multiple versions of digital visualizations using various software packages

1. **Visualization of Numerical Data :** Assigning data to appropriate chart elements, using glyphs, parallel coordinates, and streamgraphs, as well as implementing principles of design and color to make your visualizations more engaging and effective.
2. **Visualization of Non-Numerical Data:** Visualize graphs that depict relationships between data items and plot data using coordinates.
3. **Basic and Specialized Visualization Tools:** Learn and develop area plots, histograms, bar charts, pie charts, box plots and scatter plots and bubble plots using Matplotlib.
4. Visualization basics via linear regression graphing.
5. Visualization for time-series analysis.
6. Visualization for ranking analysis.
7. Visualization for deviation analysis.
8. Visualization for correlation analysis.
9. Visualization for multivariate analysis.
10. Visualization in R using ggplot.
11. Spatial Analysis with R.
12. The Visualization Dashboard.

Software : R, Python, Tableau

P19MDS512	INTERNET OF THINGS	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

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

- Appreciate the evolution and applications of IoT
- Identify suitable/appropriate sensors for an application and understand circuits
- Analyze different options for Embedded systems, connectivity and networking protocol and apply the appropriate one for a given application
- Examine the important aspects of IoT architectures and write programs for Arduino and Raspberry Pi
- Identify the security issue and solve the issues

UNIT I **9**

IOT – MOTIVATION AND APPLICATIONS

Importance of IoT. Motivating Applications of IoT:

Smart Cities- Smart Waste Management, Smart Street Lights, Smart Street Parking, Security without Surveillance, Connected Vehicles. Healthcare- Baby Monitoring, Elderly Monitoring, Mood Enhancing, Disease Treatment and Progression Monitoring, Enhance Adherence, Challenges. Agriculture- Precision Agriculture, Connected Livestock, Food Safety. Manufacturing and Logistics- Smart Manufacturing- Smart Packaging, Smart Label. Smart Electricity Grid- Managing Supply and Demand. Home Automation

UNIT II **8**

SENSORS AND CIRCUITS

Sensor – Introduction, Terminology, Behavior, Selection,Circuits – Overview and Applications, Battery Issue and Energy Management, Wireless Link, Digital and Analog – Digital Computing, Analog to Digital Interfaces

UNIT III **9**

EMBEDDED SYSTEMS, CONNECTIVITY AND NETWORKING

Embedded Systems – Overview, Technology Drivers, Energy, Microcontrollers, Software Connectivity and Networking – Introduction, Connectivity Challenges in IoT, Energy Harvesting Transmitters, Massive Multiple Access, Computation vs Communication

UNIT IV **9**

ARCHITECTURE AND PROGRAMMING

IoT Architectures – embedded System, Gateway and Cloud (MGC) Architecture and other reference models and architectures Arduino vs Raspberry Pi vs Electric Imp – Key features and comparisons Arduino Interfaces – Arduino IDE – Programming

UNIT V **10**

IOT CHALLENGES AND SECURITY STANDARDS

Technology Challenges – Security, Connectivity, Compatibility and Longevity, Standards, Intelligent Analysis and Actions .IoT Society Challenges – Privacy, Regulatory Standards -IoT security lifecycle - Cloud services and IoT – offerings related to IoT from cloud service providers – Cloud IoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing

Total: 45

REFERENCE BOOKS

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley & Sons Ltd., UK, 2014
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4. Dieter Uckelmann, Mark Harrison and Florian Michahelles, “Architecting the Internet of Things”, Springer, NewYork, 2011
5. Olivier Hersent, David Boswarthick and OmarElloumi, “The Internet of Things: Key Applications and Protocols”, John Wiley & Sons Ltd., UK, 2012
6. B. Rusell and D. Van Duren, “Practical Internet of Things Security,” Packet Publishing, 2016

P19MDS513 DATA WAREHOUSING AND DATA MINING L T P C Marks

3 0 0 3 100

COURSE OUTCOMES

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

- Describe the role of statistics in data mining and identify a suitable mining technique to solve the given problem
- Identify and apply various data preprocessing techniques to improve data quality
- Analyze various classifications and clustering methods
- Apply OLAP operations to query processing in data mining
- Apply various mining techniques to developing areas-Web mining, Text mining and social networks and time series data

UNIT I **9**

INTRODUCTION

Relation to Statistics, Databases- Data Mining Functionalities-Steps in Data Mining Process-Architecture of a Typical Data Mining Systems- Classification of Data Mining Systems - Overview of Data Mining Techniques-Issues

UNIT II **9**

DATA PREPROCESSING AND ASSOCIATION RULES

Data Preprocessing-Data Cleaning, Integration, Transformation, Reduction, and Discretization Concept Hierarchies- Concept Description: Data Generalization And Summarization Based Characterization- Mining Association Rules In Large Databases – Analysis of Attribute Relevance- Exploratory Data Analysis Using tools (Python, Weka and R).

UNIT III **9**

PREDICTIVE MODELING

Classification and Prediction: Issues Regarding Classification and Prediction-Classification By Decision Tree Induction-Bayesian Classification-Classification by Back Propagation - Other Classification Methods-Prediction- Clusters Analysis: Types Of Data In Cluster Analysis- Categorization Of Major Clustering Methods: Partitioning Methods –Hierarchical Methods – Density Based Methods – Grid Based – Model Based – Outlier Analysis- Case Studies using tool (Python, Weka & R).

UNIT IV **9**

DATA WAREHOUSING

Data Warehousing Components -Multi Dimensional Data Model- Data Warehouse Architecture-Data Warehouse Implementation- -Mapping the Data Warehouse to Multiprocessor Architecture- OLAP Need-Categorization of OLAP Tools – OLAP Operations in Multidimensional Data Model

UNIT V **9**

APPLICATIONS

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis-Web Mining- Sentimental Analysis-Mining Multimedia data on the Web, Automatic classification of Web documents- Mining Time Series data and Sequential Pattern Mining

Total: 45

REFERENCE BOOKS

1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2002
2. Alex Berson,Stephen J. Smith, “Data Warehousing, Data Mining,& OLAP”, Tata Mcgraw- Hill, 2004.
3. Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth And Ramasamy Uthurusamy, "Advances In Knowledge Discovery And Data Mining", The M.I.T Press, 1996.
4. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
5. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997
6. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
7. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman, ”Mining of Massive Datasets”, Cambridge University Press, Second Edition,2016
8. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

P19MDS514 INFORMATION RETRIEVAL TECHNIQUES

L	T	P	C	Marks
3	0	0	3	100

COURSE OUTCOMES

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

- Describe the concepts of Information Retrieval system
- Analyze various models of retrieval methods
- Identify and design the various components of an Information Retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval
- Design an efficient search engine and analyze the Web content structure

UNIT I **9**

INTRODUCTION: MOTIVATION

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics– The impact of the web on IR —IR Versus Web Search–Components of a Search engine

UNIT II **9**

MODELING

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing

UNIT III **9**

INDEXING

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV **9**

CLASSIFICATION AND CLUSTERING

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V **9**

SEARCHING THE WEB

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

Total: 45

REFERENCES

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, ―Introduction to Information Retrieval‖, Cambridge University Press, First South Asian Edition, 2008
2. Implementing and Evaluating Search Engines‖, The MIT Press, Cambridge, Massachusetts London, England, 2010
3. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, ―Modern Information Retrieval: The concepts and Technology behind Search‖ (ACM Press Books), Second Edition, 2011
4. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, ―Information Retrieval

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Information Technology
Branch: M.Tech. Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P19MIT201	High Performance Computing	3	0	0	3
2	P19MIT202	Cyber Security	3	0	0	3
3	P19MIT520	**Elective -** Data Mining	3	0	0	3
4	P19MIT517	**Elective -** Human Computer Interaction	3	0	0	3
5	P19MIT501	**Elective -** Internet of Things	3	0	0	3
6	P19GE702	**Audit Course** – Stress Management by Yoga	2	0	0	0
Practical						
7	P19MIT203	Internet of Things Laboratory	0	0	4	2
8	P19MIT204	High Performance Computing Laboratory	0	0	4	2
					Total Credits	**19**

Approved by

Chairperson, Information Technology BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.J.Akilandeswari	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/IT, Second Semester M.Tech IT Students and Staff, COE

P19MIT201 HIGH PERFORMANCE COMPUTING 3 0 0 3

COURSE OUTCOMES

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

1. Apply the parallel algorithm principles in optimization problems
2. Write programs to implement parallel algorithms on shared memory using Open MP
3. Write programs to implement parallel algorithms on distributed memory using MPI
4. Implement parallel algorithm using Hybridized programming model with OpenMP and MPI
5. Write parallel program in CUDA architecture

UNIT I INTRODUCTION TO PARALLEL ALGORITHM 9

Principles of Parallel Algorithms- Graph Algorithms- Minimum Spanning Tree- Prim's Algorithm - Single-Source Shortest Paths-Dijkstra's Algorithm – All-Pairs Shortest Paths . Algorithms for Sparse Graphs - Search Algorithms for Discrete Optimization Problems - Sequential Search Algorithms - - Parallel Depth-First Search – Parallel Breadth-First Search - Dynamic Programming - Serial Monadic DP Formulations –No serial Monadic DP Formulations - Serial Polyadic DP Formulations.

UNIT II PARALELL PROGRAMING WITH OPEN MP 9

Shared-memory parallel programming with OpenMP- Introduction to OpenMP – Parallel execution - Data scoping -OpenMP work sharing for loops – Synchronization Reductions - Loop scheduling - Miscellaneous - Case study-OpenMP-parallel Jacobi algorithm - Advanced OpenMP-Wavefront parallelization - Efficient OpenMP programming - Profiling OpenMP programs.

UNIT III PARALELL PROGRAMING WITH MPI 9

Distributed-memory parallel programming with MPI- Message passing- MPI – example - Messages and point-to-point communication - Collective communication – Non blocking point-to-point communication - Virtual topologies - Example- MPI parallelization of Jacobi solver - Communication parameters -Synchronization serialization- contention - Implicit serialization and synchronization - Contention -Reducing communication overhead - Optimal domain decomposition – Aggregating messages - Non blocking vs. asynchronous communication.

UNIT IV HYBRID PARALLIZATION MODEL 9

Hybrid parallelization with MPI and OpenMP- Basic MPI/OpenMP programming models - Vector mode implementation - Task mode implementation - Case study- Hybrid Jacobi solver - MPI taxonomy of thread interoperability - Hybrid decomposition and mapping - Potential benefits and drawbacks of hybrid programming.

UNIT V CUDA PROGRAMMING MODEL 9

CUDA Architecture, Using the CUDA Architecture, Applications of CUDA Introduction to CUDA C-Write and launch CUDA C kernels, Manage GPU memory, Manage communication and synchronization, Parallel programming in CUDA- C

THEORY: 45 Hours TUTORIAL: - PRACTICAL:- TOTAL: 45 Hours

TEXT BOOK

1. Georg Hager and Gerhard Wellein, "Introduction to High Performance Computing for Scientists and Engineers", Chapman & Hall, 2010.
2. Ananth Grama and George Karypis, "Introduction to parallel computing", Addison -Wesley, 2009.

REFERENCES:

1. John Levesque and Gene Wagenbreth, “High Performance Computing: Programming and Applications”, Chapman & Hall, 2010.
2. John L. Hennessy and David Patterson, “Computer Architecture- A Quantitative Approach”, Elsevier, 2012.
3. Michael Quinn, “Parallel Programming in C with MPI and OpenMP”, Indian edition, McGraw Hill Education, 2017.
4. Shane Cook, “CUDA Programming: A Developer's Guide to Parallel Computing with GPUs”, Morgan Kaufmann Publishers Inc. San Francisco, CA, USA 2013

P19MIT202 CYBER SECURITY 3 0 0 3

COURSE OUTCOMES

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

1. Explain importance of cyber security and its essentials through various examples of cybercrimes in the world.
2. Analyze possible cyber attacks, the security challenges of mobile devices and implement organizational security Policies and measures.
3. Describe tools, methods used by cyber criminals and apply various techniques to protect against the cyber attack.
4. Explain importance of cyber laws, cybercrime scenario in India and amendments made in the Indian ITA.
5. Apply a suitable tools and techniques for analyzing and validating forensics data

UNIT-1 INTRODUCTION TO CYBERCRIME 9

Introduction - Cybercrime: Definition - Cybercrime and Information Security- Cybercriminals- Classifications of Cybercrimes - Cybercrime: The Legal Perspectives -Cybercrimes: An Indian Perspective - Cybercrime and the Indian ITA 2000 - A Global Perspective on Cybercrimes- Attacks - Social Engineering - Cyber stalking - Cybercafé and Cybercrimes- Botnets: The Fuel for Cybercrime - Attack Vector - Cloud Computing

UNIT-II CYBERCRIME IN MOBILE DEVICES 9

Proliferation of Mobile Devices - Trends in Mobility - Credit Card Frauds in Mobile and Wireless Computing Era- Security Challenges Posed by Mobile Devices -Registry Settings for Mobile Devices - Authentication Service Security - Attacks on Mobile/Cell Phones - Mobile Devices: Security Implications for Organizations - Organizational Measures for Handling Mobile - Organizational Security Policies and Measures in Mobile Computing Era.

UNIT-III TOOLS AND METHODS USED IN CYBERCRIME 9

Proxy Servers and Anonymizers - Phishing - Password Cracking -Keyloggers and Spywares - Virus and Worms - Trojan Horses and Backdoors - Steganography - DoS and DDoS Attacks - SQL Injection - Buffer Overflow.

UNIT-IV CYBERCRIMES AND CYBERSECURITY: THE LEGAL PERSPECTIVES 9

Cybercrime and the Legal Landscape around the World -Cyberlaws: The Indian Context -· The Indian IT Act - Challenges to Indian Law and Cybercrime Scenario in India - Consequences of Not Addressing the Weakness in Information Technology Act - Digital Signatures and the Indian IT Act - Amendments to the Indian IT Act - Cybercrime and Punishment - Cyberlaw, Technology and Students: Indian Scenario.

UNIT-V UNDERSTANDING COMPUTER FORENSICS 9

Historical Background of Cyberforensics - Digital Forensics Science - The Need for Computer Forensics - Cyberforensics and Digital Evidence - Forensics Analysis of E-Mail - Digital Forensics Life Cycle - Chain of Custody Concept - Network Forensics - Approaching a Computer Forensics Investigation -· Setting up a Computer Forensics Laboratory: Understanding the Requirements - Computer Forensics and Steganography -· Forensics and Social Networking Sites: The Security/Privacy Threats - Computer Forensics from Compliance Perspective - Challenges in Computer Forensics - Special Tools and Techniques - Forensics Auditing – Antiforensics,

THEORY: 45 TUTORIAL: - PRACTICAL: TOTAL: 45 Hours

REFERENCES

1. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short "Cyber Security Essentials" Wiley India Publications oct 2018
2. Nina Godbole, Sunit Belapur "Cyber Security"- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives –, Wiley India Publications Released: April 2011
3. MarjieT.Britz, ―"Computer Forensics and Cyber Crime‖: An Introduction"‖, 3rd Edition, Prentice Hall, 2013.
4. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.
5. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.
6. Richard A. Clarke, Robert Knake "Cyberwar: The Next Threat to National Security & What to Do About It" Ecco 2010.

P19MIT203 INTERNET OF THINGS LABORATORY 0 0 4 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.

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
13. Interface ultrasonic sensor with Rapberry pi for distance measurement

THEORY: - TUTORIAL: - PRACTICAL: 60 TOTAL: 60 Hours

P19MIT204 HIGH PERFORMANCE COMPUTING LABORATORY 0 0 4 2

COURSE OUTCOMES

1. Write programs to implement parallel algorithms using Open MP and MPI
2. Implement parallel algorithm using Hybridized programming model with OpenMP and MPI
3. Write parallel program in CUDA architecture

LIST OF EXPERIMENTS

1. Implement the parallel breadth first and depth first search using OPEN MP
2. Implement the sequential search algorithm using OPEN MP
3. Implement the parallelization of Jacobi solver using MPI
4. Demonstrate how non-blocking and asynchronous communication can be achieved using MPI
5. Implement the Matrix factorization in hybrid programming model of OPEN MP and MPI.
6. Demonstrates how to use GPU assert in a CUDA C program.
7. Demonstrates Parallel Reduction using Min, Max, Sum and Average operations
8. Demonstrates Parallel Binary search for sorted array using CUDA
9. Demonstrates an advanced quicksort implemented using CUDA
10. Demonstrates an advanced bubble sort implemented using CUDA
11. Demonstrates an advanced Merge sort implemented using CUDA
12. Demonstrates the use of OpenMP and CUDA streams with Unified Memory on a single GPU.
13. Demonstrates compilation of matrix multiplication CUDA kernel at runtime using libNVRTC.
14. Demonstrates compilation of CUDA kernel performing vector addition at runtime using libNVRTC.

THEORY: - TUTORIAL: - PRACTICAL: 60 TOTAL: 60 Hours

P19MIT520 **DATA MINING** **3 0 0 3**

COURSE OUTCOMES

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

1. Implement efficient Data ware house system specific to the problem
2. Explain the data mining techniques and applications
3. Apply data preprocessing on raw data and identify interesting pattern using association rule mining
4. Construct the supervised and unsupervised classifier to differentiate the target label.
5. Apply different clustering technique on preprocessed data to derive useful patterns.

UNIT I DATA WAREHOUSING 9

Data warehouse - Basic Concepts, Data warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute Oriented Induction, Data Cube Computation Preliminary Concepts.

UNIT II INTRODUCTION TO DATA MINING 9

Why Data Mining?, What is Data Mining?, Kinds of Data to be Mined, Patterns of Data – Technologies, applications, Major Issues, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity.

UNIT III DATA PREPROCESSING AND MINING FREQUENT PATTERNS 9

Overview, Data Cleaning, Data Integration, Data reduction, Data Transformation and Data Discretization, Mining Frequent Patterns, Associations and Correlations – Basic Concepts, Frequent Itemsets Mining, Pattern Evaluation Methods, Mining Multilevel Associations, Mining Rare and Negative Patterns, Applications of Pattern Mining.

UNIT IV CLASSIFICATION 9

Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule Based Classification, Model Evaluation and Selection, Classification by Back Propagation, Support Vector Machines, Classification using Frequent Patterns, Lazy Learners.

UNIT V CLUSTER ANALYSIS AND OUTLIER DETECTION 9

Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Evaluation of Clustering, Probabilistic Model based Clustering, Clustering High Dimensional Data, Clustering Graph and Network Data**, Outlier Detection** - Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Clustering Based Approaches, Classification Based Approaches.

THEORY: 45 Hours TUTORIAL: - PRACTICAL: - TOTAL: 45 Hours

REFERENCES:

1. Jiawei Han, Micheline Kamber and Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann, 2011.
2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata Mc Graw Hill Edition, Tenth Reprint 2007.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Pearson Education, 2007.
4. K.P. Soman, Shyam Diwakar and V. Ajay “, Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
6. Soumendra Mohanty, “Data Warehousing Design, Development and Best Practices”, Tata McGraw Hill Edition, 2006.

P19IT517 HUMAN COMPUTER INTERACTION 3 0 0 3

COURSE OUTCOMES

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

1. Identify the importance and usability levels for interactive systems.
2. Analyze the development process involved in user interface.
3. Develop skills in handling virtual environments and its exploitation.
4. Comprehend the diverse input methods available for interfacing.
5. Explain the recent technologies and its application of HCI.

UNIT I IMPORTANCE OF USER INTERFACE 10

Definition - importance of good design - Benefits of good design - History of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions.

UNIT II SCREEN DESIGNING 10

Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition– amount of information – focus and emphasis – presentation information simply and meaningfully– information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT III VIRTUAL ENVIRONMENT 9

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors- Virtual Augmented Reality techniques.

UNIT IV INTERACTION DEVICES 8

Interaction Devices –Keyboard and function keys – pointing devices – speech recognition digitization and generation –image and video displays – drivers.

UNIT V TECHNOLOGIES FOR HCI 8

HCI and related fields – Cognition Theory – A.I. – Accessibility Issues – Assistive Technologies- Technologies for HCI – Research Directions in HCI.

THEORY: 45 Hours TUTORIAL: - PRACTICAL: - TOTAL: 45 Hours

REFERENCES:

1. Wilbert O. Galiz, “The Essential guide to User Interface Design”, Wiley Dreamtech, 2018.
2. Alan Cooper, “The Essentials of User Interface Design”, Wiley India Pvt. Ltd, 4th edition 2016
3. Ben Shneiderman, Plaisant, Cohen, Jacobs, "Designing the User Interface”, 5th Edition, Addison-Wesley, 2014.
4. Julie A. Jacko (Ed), “The Human-Computer Interaction Handbook”, 3rd edition, CRC Press, 2012.
5. Jonathan Lazar, Jinjuan Heidi Feng, & Harry Hochheiser, “Research Methods in Human Computer Interaction”, Wiley, 2010
6. Helen Sharp; Yvonne Rogers; Jenny Preece, “Interaction Design”, Wiley Dreamtech,2nd edition, 2007
7. Soren Lauesen,”User Interface Design”, Pearson Education, 2005.
8. Alan Dix, Janet Finlay, Gregory Abowd & Russell Beale, “Human-Computer Interaction”, 3rd Edition. Prentice Hall, 2004.
9. Barfied, Lon, “The User Interface: Concepts and Design", Addison –Wesley, 2004.

P19MIT501 INTERNET OF THINGS 3 0 0 3

COURSE OUTCOMES

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

1. Explain the concept of IoT and identify the functions of different actuators and sensors.
2. Analyze various protocols for IoT.
3. Design an IoT system using Rasperry Pi/Arduino
4. Implement web based services on IoT devices
5. Analyze applications of IoT in real time scenario

UNIT I FUNDAMENTALS OF IoT 9

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT II IoT PROTOCOLS 9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III DESIGN AND DEVELOPMENT 9

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

UNIT IV IoT PHYSICAL SERVERS AND CLOUD OFFERINGS 9

Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API

UNIT V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

THEORY: 45 Hours TUTORIAL: - PRACTICAL: - TOTAL: 45 Hours

TEXTBOOK:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2015

REFERENCES:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit 2).
3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

Audit Course

P19GE701 **English for Research Paper Writing**

2 0 0 0

Course Outcomes:

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

- Demonstrate research writing skills both for research articles and thesis
- Frame suitable title and captions as sub-headings for articles and thesis
- Write each section in a research paper and thesis coherently
- Use language appropriately and proficiently for effective written communication
- Exhibit professional proof-reading skills to make the writing error free

Unit – I **6**

Planning and preparation, word order, breaking up long sentences, organising ideas into paragraphs and sentences, being concise and avoiding redundancy, ambiguity and vagueness

Unit – II **6**

Interpreting research findings, understanding and avoiding plagiarism, paraphrasing sections

of a paper/ abstract.

Unit- III **6**

Key skills to frame a title, to draft an abstract, to give an introduction

Unit – IV **6**

Skills required to organise review of literature, methods, results, discussion and conclusions

Unit – V **6**

Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing.

Text Books:

1.Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2.HighmanN , Handbook of Writing for the Mathematical Sciences, SIAM.Highman's book, 1998.
3. Day R, How to Write and Publish a Scientific Paper, Cambridge University Press, 2006.
4.Goldbort R, Writing for Science, Yale University Press, 2006. (available on Google Books)

Total: 30 hours

REFERENCES

Martin Cutts, Oxford Guide to Plain English, Oxford University Press, Second Edition, 2006

P19GE702 **Stress Management by Yoga**

2 0 0 0

Course Outcomes:

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

1. Develop physical and mental health thus improving social health
2. Increase immunity power of the body and prevent diseases
3. Acceleratememory power
4. Achieve the set goal with confidence and determination
5. Improve stability of mind, pleasing personality and work with awakened wisdom

UNIT – I **6**

Yoga-Introduction - Astanga Yoga- 8 parts-Yam and Niyam etc.- Do`s and Don'ts in life-Benefits of Yoga and Asana- Yoga Exercise- and benefits- Pranayam Yoga- Nadisuthi, Practice and Spinal Sclearance Practice-Regularization of breathing techniques and its effects-Practice and kapalapathy practice.

UNIT – II **6**

Neuromuscular breathing exercise and Practice- Magarasa Yoga, 14 points Acupressure techniques and practice- Body relaxation practice and its benefits- Raja Yoga- 1.Agna –explanation and practice- Activation of Pituitary- Raja Yoga-2. Santhi Yoga-Practice-Balancing of physical and mental power.

UNIT – III **6**

Raja Yoga-3.Sagasrathara yoga –practice- Activation of dormant brain cells-Kayakalpa-theory- Kayakalpa – practice-Yogic exercise to improve physical and mental health and practice-Asanas –explanation-Practice-benefits

UNIT –IV **6**

Sun namaskar- 12 poses-explanation and practice-Yoga –Asana-Padmasana, vajrasana,chakrasana, viruchasanaetc-Stress management with Yoga-Role of women and Yoga
Equality, nonviolence, Humanity,Self- control- Food and yoga Aware of self-destructive habits
Avoid fault thinking (thought analysis-Practice)-Yoga Free from ANGER (Neutralization of anger)& practice

UNIT – V **6**

Moralisation of Desire & practice- Punctuality-Love-Kindness-CompassionEradication ofworries-Practice - Personality development, positive thinking-Good characters to lead a moral life
How to clear the polluted mind- Benefits of blessing- Five- fold culture –explanation- Karma Yoga Practice In Geetha- Sense of duty-Devotion, self- reliance, confidence, concentration, truthfulness, cleanliness.

Total : 30 hours

Reference Books

1. 'Yogic Asanas for Group Tarining-Part-I" Janardan Swami YogabhyasiMandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata