# GURU GHASIDAS VISHWAVIDYALAYA
# BILASPUR (C.G.)

(A Central University)

Koni, Bilaspur-495009, C.G (India)

**OUTCOME BASED EDUCATION**
**WITH**
**CHOICE BASED CREDIT SYSTEM (CBCS)**

**MASTER OF TECHNOLOGY**
**IN**
## Information Technology

**COURSE STRUCTURE AND SYLLABUS**

**M.Tech Regular Two Year Degree Program**
**(Effective from the academic year 2023-24)**


**DEPARTMENT OF INFORMATION TECHNOLOGY**
**SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY,**
**GGV, BILASPUR, C.G. (INDIA)**

**DEPARTMENT OF INFORMATION TECHNOLOGY**
**SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY, GGV, BILASPUR, C.G. (INDIA)**

# SCHEME OF EXAMINATION

## M.TECH. INFORMATION TECHNOLOGY

## M.Tech. I-Semester

| Sl. | Course Type/ Code | Subjects | Periods/Week | | | Evaluation | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | IA | ESE | Total | |
| 1. | ITPATT1 | Mathematical Foundations of Computer Science | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 2. | ITPATT2 | Advanced Data Structures | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 3. | ITPATT3 | Principles of Wireless Sensor & Actuator Networks | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 4. | <br>ITPATP1<br>ITPATP2<br>ITPATP3<br><br>ITPATP4 | Elective – I<br>1. Advance Operating System<br>2. Digital Forensics<br>3. Mobile Application Development<br>4. Machine Learning | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 5 | <br>ITPATP5<br>ITPATP6<br>ITPATP7<br>ITPATP8 | Elective – II<br>1. Network Security<br>2. Cloud Computing<br>3. Data Mining<br>4. Deep Learning | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 6. | ITPALT2 | Wireless Sensor Network Lab | 0 | 0 | 4 | 30 | 20 | 50 | 2 |
| 7. | ITPATC1 | Research Methodology and IPR | 2 | 0 | 0 | - | 50 | 50 | 2 |
| Total | | | 17 | 0 | 4 | 230 | 370 | 600 | 19 |

# M.Tech. II-Semester

| Sl. | Course Type/ Code | Subjects | Periods/Week | | | Evaluation | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | IA | ESE | Total | |
| 1. | ITPBTT1 | Advanced Algorithms | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 2. | ITPBTT2 | Advanced Computer Architecture | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 3. | <br>ITPBTP1<br>ITPBTP2<br>ITPBTP3<br>ITPBTP4 | Elective – III<br>1. Web and Database Security<br>2. Internet of Things<br>3. Data Science<br>4. High Performance Computing | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 4. | <br>ITPBTP5<br><br>ITPBTP6<br>ITPBTP7<br>ITPBTP8 | Elective – IV<br>1. Information Warfare & Security<br>2. Cyber Security<br>3. Advanced Computer Networks<br>4. Big Data Analytics | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 5 | <br>MSPBTO1<br>IPPBTO2<br>IPPBTO3<br>CEPBTO4<br><br>MEPBTO5<br>CHPBTO6<br>ECPBTO7<br>MCPBTO8<br>ITPBTO9<br><br>CSPBTO9 | Open Elective-1<br>1. Business Analytics<br>2. Industrial Safety<br>3. Operations Research<br>4. Cost Management of Engineering Projects<br>5. Composite Materials<br>6. Waste to Energy<br>7. IoT (Not for IT)<br>8. MOOCs<br>9. Software Engineering Techniques<br>10. Enterprise Resource Management | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 6. | ITPBLT1 | Advanced Algorithms Lab | 0 | 0 | 4 | 30 | 20 | 50 | 2 |
| 7. | ITPBLT2 | Data Science Lab | 0 | 0 | 4 | 30 | 20 | 50 | 2 |
| 8. | <br>ELPBTX1<br><br><br>PEPBTX2<br>CEPBTX3<br><br>LAPBTX4 | Audit Course/Value Added Course<br>English for Research Paper Writing<br>Stress Management by Yoga<br>Disaster Management<br>Constitution of India | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| Total | | | 17 | 0 | 08 | 300 | 400 | 700 | 21 |

**Note: Under MOOCs the students have to opt any subject other than Information Technology from NPTEL/UGC SWAYAM**

## M.Tech. III-Semester

| Sl. | Course Type/ Code | Subjects | Periods/Week | | | Evaluation | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | IA | ESE | Total | |
| 1. | ITPCPT1 | Dissertation Stage–I | 0 | 0 | 28 | 100 | 100 | 200 | 14 |
| Total | | | 0 | 0 | 28 | 100 | 100 | 200 | 14 |

## M.Tech. IV-Semester

| Sl. | Course Type/ Code | Subjects | Periods/Week | | | Evaluation | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | IA | ESE | Total | |
| 1. | ITPDPT1 | Dissertation Stage–II | 0 | 0 | 32 | 100 | 200 | 300 | 16 |
| Total | | | 0 | 0 | 32 | 100 | 200 | 300 | 16 |

**Total Credits for the Program = 19 + 21 +14 +16 = 70**

| Subject: | Research Methodology and IPR (IPPATC1) | Credits | | | |
|---|---|---|---|---|---|
| Type: | MLR | L | T | P | Total |
| Teaching Scheme: | Lectures: 2 hours/week | 2 | 0 | 0 | 2 |

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

1 Understand research problem formulation.

2 Analyze research related information

3 Follow research ethics

4 Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property

5 Right to be promoted among students in general & engineering in particular.

6 Understand research problem formulation.

**Syllabus Contents:**

- **Introduction and Design of research**: Meaning, objectives and significance of research, types and parameters of research, research process, identification and definition of the research problem, definition of construct and variables, pure and applied research design, exploratory and descriptive design methodology, qualitative vs. quantitative research methodology, field studies, field experiments vs. laboratory experiments, research design in social and physical sciences.

- **Data and Methods of Data Collection**: Survey, assessment and analysis: data collection, primary and secondary sources of data, Collection of primary data through questionnaire and schedules. Collection of secondary data, processing and analysis of data. Sample survey, simple random sampling, stratified random sampling, systematic sampling, cluster sampling, area sampling and multistage sampling. Pilot survey, scaling techniques, validity & reliability.

- **Data Analysis:** Procedure for testing of hypothesis, the null hypothesis, determining levels of significance, type i and ii errors, grouped data distribution, measures of central tendency, measures of spread/dispersion, normal distribution, analysis of variance: one way, two way, chi square test and its application, students 'T' distribution, non-parametric statistical techniques, binomial test. Correlation and regression analysis – discriminate analysis – factor analysis – cluster analysis, measures of relationship

- Research report preparation and presentation: Review of literature: historical survey and its necessity, layout of research plan, meaning, techniques and precautions of interpretation, types of report: technical report, popular report, report writing – layout of research report, mechanics of writing a research report. Writing bibliography and references.

- Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

**References:**


- Research in education, By J W Best and J V Kahn, Pearson/ Allyn and Bacon.
- Research Methodology – Methods and Techniques, C K Kothari, New Age International.
- Design and Analysis of Experiments, D C Montgomery, Wiley.
- Applied Statistics & Probability for Engineers, D C Montgomery & G C Runger, Wiley.
- Management Research Methodology: Integration of Principles, Methods and Techniques, K N Krishnaswamy, A I Sivakumar and M Mathiranjan, Pearson Education.


| | | |
|---|---|---|
| Subject: | Business Analytics (MSPBTO1) | Credits |

| Type: | Open Elective | L | T | P | Total |
|---|---|---|---|---|---|
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

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

1 Students will demonstrate knowledge of data analytics

2 Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.

3 Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.

4 Students will demonstrate the ability to translate data into clear, actionable insights.

## Syllabus Contents:

- Unit1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.
- Unit 2: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.
- Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.
- Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.
- Unit 5:Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, the Value of Information, Utility and Decision Making.
- Unit 6:Recent Trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

## References:


- Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
- Business Analytics by James Evans, persons Education..


| Subject: | Industrial Safety (IPPBTO2) | Credits |
|---|---|---|

| Type: | Open Elective | L | T | P | Total |
|---|---|---|---|---|---|
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

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

1 Apply the knowledge of Safety Measures

2 Plan for Engineering maintenance.

3 Determine the wear &Corrosion and apply methods for their prevention.

4 Trace the Fault of machine tools and equipment

5 Plan and implement the periodic and preventive maintenance for machines/equipment.

## Syllabus Contents:

- Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.
- Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.
- Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.
- Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.
- Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

## References:


- Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
- Maintenance Engineering, H. P. Garg, S. Chand and Company.
- Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
- Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

| Subject: | Operations Research (IPPBTO3) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Open Elective | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

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

1 Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.

2 Students should able to apply the concept of non-linear programming

3 Students should able to carry out sensitivity analysis

4 Student should able to model the real world problem and simulate it.

## Syllabus Contents:

- Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models
- Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming
- Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT
- Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.
- Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

## References:


- H.A. Taha, Operations Research, An Introduction, PHI, 2008
- H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
- J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008
- Hitler Libermann Operations Research: McGraw Hill Pub. 2009
- Pannerselvam, Operations Research: Prentice Hall of India 2010
- Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

| Subject: | Cost Management of Engineering Projects (CEPBTO4) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Open Elective | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

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

1 Discuss the cost concepts in the cost management process.

2 Able to handle the projects by the application of project cost control methods.

3 Determine all types of costing and carryout the analysis of pricings for profitability.

4 Application of PERT/CPM for cost management.

## Syllabus Contents:

- Introduction and Overview of the Strategic Cost Management Process
- Cost concepts in decision-making; relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.
- Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process
- Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.
- Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

## References:


- Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
- Charles T. Horngren and George Foster, Advanced Management Accounting
- Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
- Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
- N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

| Subject: | Composite Materials (MEPBTO5) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Open Elective | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

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

1 Explain and also implement the composite materials for the required performance based on the characteristics.

2 Adopt the composite materials as reinforcements.

3 Implement the methods of manufacturing of metal matrix composites

4 Adopt the methods of manufacturing of polymer matrix composites

5 Evaluate the strength of laminates.

## Syllabus Contents:

- INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.
- REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.
- Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.
- Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.
- Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations

## References:


- Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
- Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.
- Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
- Hand Book of Composite Materials-ed-Lubin.
- Composite Materials – K.K.Chawla.
- Composite Materials Science and Applications – Deborah D.L. Chung.

- Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

| **Subject:** | **Waste to Energy (CHPBTO6)** | **Credits** | | | |
|---|---|---|---|---|---|
| Type: | Open Elective | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

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

1 Classify the waste for fuel and identify the devices for conversion of waste to energy.

2 Implement the Biomass Pyrolysis

3 Evaluate the methods of Biomass Gasification and implement their applications.

4 To design, construct and operation the Biomass Combustion devices.

5 Classify biomass, apply the bio energy systems design and construction.

## Syllabus Contents:

- Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors
- Biomass Pyrolysis: Pyrolysis – Types, slow, fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.
- Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.
- Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.
- Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

## References:


- Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
- Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
- Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
- Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

| Subject: | Internet of Things (IoT) (ECPBTO7) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Open Elective | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

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

1 Understand the concepts of Internet of Things.

2 Analyze basic protocols in wireless sensor network.

3 Design IoT applications in different domain and be able to analyze their performance

4 Elaborate the need for Data Analytics and Security in IoT.

5 Understand the concepts of Internet of Things.

**Syllabus Contents:**

Review of computer communication concepts (OSI layers, components, packet communication, Networks, TCP-IP, subnetting, IPV4 addressing and challenges). IPV6 addressing. IoT architecture reference layer. Characteristics IoT sensor nodes, Edge computer, cloud and peripheral cloud, single board computers, open source hardware, Examples of IoT infrastructure.

**IoT and M2M**

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

**IOT protocols and Communication Technologies**

MQTT, UDP, MQTT brokers, publish subscribe modes, HTTP, COAP,XMPP and gateway protocols, IoT Communication Pattern, IoT Protocol Architecture, Selection of Wireless technologies ( 6LoWPAN, Zigbee, WIFI, BT, BLE,SIG,NFC, LORA, Lifi, Widi).

**Data and Analytics for IoT**

An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IOT Security, Common Challenges in IOT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased

Application of Security in an Operational Environment.

**IoT Physical Devices and Endpoints**: Introduction to Arduino and Raspberry Pi-Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

**IoT Physical Servers and Cloud Offerings**: 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.

**IoT application and its Variants: Case studies:** IoT for smart cities, smart grid, health care, agriculture, smart meters.M2M, Web of things, Cellular IoT, Industrial IoT, Industry 4.0,IoT standards.

**References:**


- "Internet of Things - A Hands-on Approach", ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
- "Internet of Things",Srinivasa K G, CENGAGE Leaning India, 2017.
- " IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)
- "Getting Started with Raspberry Pi", Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.
- "From Machine to Machine to Internet of Things", Jan Holler, VlasiosTsiatsis, Catherine Mulligan, StamatisKarnouskos, Stefan Avesand, David Boyle, Elsevier Publications, 2014.

| Subject: | English For Research Paper Writing (ELPBTX1) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Audit Course/Value Added Course | L | T | P | Total |
| Teaching Scheme: | Lectures: 2 hours/week | 2 | 0 | 0 | 2 |

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

1 Understand that how to improve your writing skills and level of readability.

2 Learn about what to write in each section

3 Understand the skills needed when writing a Title

4 Ensure the good quality of paper at very first-time submission

## Syllabus Contents:

- Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
- Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction
- Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check
- Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Ruseful phrases, how to ensure paper is as good as it could possibly be the first- time submissioneview of the Literature.
- skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions
- useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

## References:


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

| **Subject:** | **Stress Management by Yoga (PEPBTX2)** | **Credits** | | | |
|---|---|---|---|---|---|
| Type: | Audit Course/Value Added Course | L | T | P | Total |
| Teaching Scheme: | Lectures: 2 hours/week | 2 | 0 | 0 | 2 |

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

1 Develop healthy mind in a healthy body thus improving social health also.

2 Improve efficiency

## Syllabus Contents:

- Definitions of Eight parts of yog. ( Ashtanga ).
- Yam and Niyam, Do`s and Don't's in life, i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.
- Asan and Pranayam, i) Various yog poses and their benefits for mind & body, ii) Regularization of breathing techniques and its effects-Types of pranayam.

## References:


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

| Subject: | Disaster Management (CEPBTX3) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Audit Course/Value Added Course | L | T | P | Total |
| Teaching Scheme: | Lectures: 2 hours/week | 2 | 0 | 0 | 2 |

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

1 Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

2 Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives

3 Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations

4 Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

## Syllabus Contents:

- Introduction Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.
- Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.
- Disaster Prone Areas in India, Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with special reference to Tsunami; Post-Disaster Diseases and Epidemics.
- Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and other agencies, Media Reports: Governmental and Community Preparedness.
- Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.
- Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of

Disaster Mitigation in India.

## References:


- R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal book Company.
- Sahni, PardeepEt. al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall of India, New Delhi.
- Goel S. L. , Disaster Administration and Management Text and Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.


| **Subject:** | **Constitution of India (LAPBTX4)** | **Credits** | | | |
|---|---|---|---|---|---|
| Type: | Audit Course/Value Added Course | L | T | P | Total |
| Teaching Scheme: | Lectures: 2 hours/week | 2 | 0 | 0 | 2 |

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

1 Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

2 Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

3 Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

4 Discuss the passage of the Hindu Code Bill of 1956.

## Syllabus Contents:

- History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working).
- Philosophy of the Indian Constitution: Preamble, Salient Features
- Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.
- Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, appointment and Transfer of Judges, Qualifications, Powers and Functions.
- Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.
- Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

## References:

- The Constitution of India, 1950 (Bare Act), Government Publication.
- Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
- M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
- D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.


## Semester-III

| **Subject:** | **Dissertation I** | **Credits** | | | |
|---|---|---|---|---|---|
| Type: | Core | L | T | P | Total |
| Teaching Scheme: | Practice hours: 28 hours/week (contact-3 hours/week) | 0 | 0 | 28 | 14 |

**Course Objectives: The course is aimed**

1 To inculcate the reviewing available research literature for Identifying the complex Research Engineering problems.

2 To practice the applications of appropriate techniques to analyze complex research engineering problems.

3 To adopt the engineering and management principles through efficient handling of the projects

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

1 Identify complex research engineering problems reviewing available literature.

2 Identify appropriate techniques to analyze complex research Engineering problems.

3 Apply engineering and management principles through efficient handling of project

### Syllabus Contents:

- Dissertation-I 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 and must bring out individuals contribution.
- Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem. and End Sem. will be monitored by the departmental committee.

## Semester-IV

| **Subject:** | **Dissertation-II** | **Credits** | | | |
|---|---|---|---|---|---|
| Type: | Core | L | T | P | Total |
| Teaching Scheme: | Practice hours: 32 hours/week (contact-3 hours/week) | 0 | 0 | 32 | 16 |

**Course Objectives: The dissertation is aimed**

1 To introduce the problem solving skills related to the complex research Engineering problems by applying appropriate techniques and tools.

2 To necessitate the exhibition of good communication skill to the engineering community and society.

3 To crop out and demonstrate the promotion of professional ethics and work culture.

**Course outcomes: At the end of the Dissertation, students will be able to**

1 Solve complex research Engineering problems by applying appropriate techniques and tools.

2 Exhibit good communication skill to the engineering community and society.

3 Demonstrate professional ethics and work culture.

### Syllabus Contents:

- Dissertation – II will be extension of the work on the topic identified in Dissertation – I.
- Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre-submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.

# M. Tech (IT) Syllabus

| Subject: | MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (ITPATT1) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Core | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Pre-Requisites**: UG level course in Discrete Mathematics/ Mathematical Foundations of Computer Science

**Course Objectives:**

1. To understand the mathematical fundamentals that are prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machinelearning.
2. To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming languagedesign, andconcurrency.
3. To study various sampling and classificationproblems.

**Course Outcomes:** After completion of course, students would be able to:

1. To understand the basic notions of discrete and continuousprobability**.**
2. To understand the methods of statistical inference, and the role that sampling distributions play in thosemethods.
3. To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

**UNIT – I**

Probability mass, density, and cumulative distribution functions, parametric families of distributions, Expected value, variance, conditional expectation,
Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markovchains

**UNIT - II**

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood,

**UNIT - III**

Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of over fitting model assessment.

**UNIT – IV**

Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems

**UNIT-V**

Computer science and engineering applications Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machinelearning.

Recent Trends in various distribution functions in mathematical field of computer science for varying fields like bio-informatics, soft computing, and computer vision.

**Text Book:**

John Vince, Foundation Mathematics for Computer Science, Springer.

**References:**

1. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science

Applications.Wiley.
2. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and ProbabilisticAnalysis.
3. Alan Tucker, Applied Combinatorics,Wiley

| Subject: | ADVANCED DATA STRUCTURES (ITPATT2) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Core | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Pre-Requisites:** UG level course in Data Structures

**Course Objectives:**

1. The fundamental design, analysis, and implementation of basic data structures.
2. Basic concepts in the specification and analysis of programs.
3. Principles for good program design, especially the uses of data abstraction.
4. Significance of algorithms in the computer field
5. Various aspects of algorithm development
6. Qualities of a good solution

**Course Outcomes:** After completion of course, students would be able to:

1. Basic ability to analyze algorithms and to determine algorithm correctness and timeefficiency class.
2. Master a variety of advanced abstract data type (ADT) and data structures and their implementations.
3. Master different algorithm design techniques.
4. Ability to apply and implement learned algorithm design techniques and data structures tosolve problems.

**UNIT – I**

Algorithms, Performance analysis- time complexity and space complexity, AsymptoticNotation-Big Oh,Omega and Theta notations, Complexity Analysis Examples. Datastructures-Linear and nonlinear data structures, ADT concept, Linear List ADT, Arrayrepresentation, Linked representation, Vector representation, singly linked lists - insertion,deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists.Representation of single, two dimensional arrays, sparse matrices and their representation.

**UNIT – II**

Stack and Queue ADTs, array and linked list representations, infix to postfix conversionusing stack, implementation of recursion, Circular queue-insertion and deletion, DequeueADT, array and linked list representations, Priority queue ADT, implementation using Heaps,Insertion into a Max Heap, Deletion from a Max Heap.

**UNIT – III**

Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolutionmethods-OpenAddressing, Chaining, Hashing.Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort,comparison of sorting methods.

**UNIT – IV**

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT,representations,recursive and non-recursive traversals, Threadedbinary trees.Graphs- Graphs terminology, Graph ADT, representations, graphtraversals/search methods - DFS and BFS, Applications ofGraphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm forSingle Source Shortest Path Problem.

**UNIT –V**

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searchingoperations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees– Definition and examples only, B-Trees-definition, insertion and searching operations,Comparison of Search trees.Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

**References:**

1. Thomas H .Coreman, Charles E.Leiserson, Ronald L.Rivest, "Introduction to Algorithms", PHI, 2002.
2. Sara Baase, Allen Ran Gelda, "Computer Algorithms and Introduction to Design and Analysis", Pearson,2000

3. S. Sahni, Data Structures, Algorithms, and Applications in C++, Silicon Press, 2/e, 2005.
4. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson,2004.
5. Aho. A.V,Hopcroft J.E, and Ullman.J.D, "Design and analysis of Computer Algorithms", Addison wesley ,1974.
6. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley,2002.
7. A. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, Data Structures Using C and C++, Prentice Hall, 2/e, 1995.

| Subject: | PRINCIPLES OF WIRELESS SENSOR & ACTUATOR NETWORKS (ITPATT3) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Core | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Course Objectives**

1. To provide in depth knowledge of sensors
2. To introduce the students the upcoming challenges of WSN
3. To give a fundamental knowledge on the basic laws and phenomena on which operation of sensor transformation of energy is based.
4. To impart a reasonable level of competence in the design, construction, and deployment of sensors

**Course Outcome**

1. Implementation of WSN
2. Critical areas of WSN
3. Deployment of WSN
4. Research issues in WSN

**UNIT-I**

Overview of Wireless sensor and actuator networks, comparison of adhoc network, infrastructure network and sensor networks. Introduction to wireless sensor Networks and wireless sensor actuator networks, Terminology WSN architecture, requirements and standards, Topologies uses in Wireless sensor and actuator network.

**UNIT-II**

Applications of wireless sensor networks and wireless sensor actuator networks, , what the challenges ,issues in wireless sensor actuator networks ?requirement for wireless sensor network deployment various standards for WSAN Development of sensor network. Overview of broadcasting techniques, backbone and broadcasting in sensor actuator networks, coverage and connectivity criteria.

**UNIT-III**

Placement and deployment of sensors in wireless sensor networks.Static sensors and mobile sensors placements. Placement by Actuators: - Least Recently Visited Approach, Snake like Deployment Approach, BackTracking-Deployment Approach Different methods used for sensor placement and deployment, Issues with the Wireless sensor network deployment Sensor Self Deployment Methods :- Virtual Force/Vector Based Approach, Mobile Sensor Migration.

**UNIT-IV**

Multicasting, multiratingcasting, geocasting and anycasting in sensor network, Routing in Wireless Sensor and Actuator Networks: flooding, gossiping, classification of routing protocols, Study of types of routing protocols used in wireless sensor network. Routing protocols based on network structures Flat networks routing – directed diffusion, SPIN, Rumor, GBR hierarchicial networks routing: - LEACH, PEGASIS, TEEN routing, location based routing: - Greedy, Face, Geographic adaptive fidelity, Geographic and energy aware routing.

**UNIT-V**

Sink Mobility:- Data gathering in Wireless Sensor Networks : - Sink tour and RP based data collection methods : Direct contact data collection, Rendezvous based data collection, Introduction to sink mobility, energy problems, Topology Control in Sensor, Actuator : - use of MST and LMST , Introduction and detection of critical nodes and links : how to identify the critical nodes and links, how to solve the problem of critical nodes and critical links.

**Text Books:**

1.Wireless Sensor and Actuator Networks Algorithms and Protocols for Scalable Coordination and Data Communication, Edited by AmiyaNayak and Ivan Stojmenovic A JOHN WILEY & SONS, INC., PUBLICATION,2010.

2. Wireless Communications & Networks, 2nd Edition, William Stallings ,Pearson Education India,2009 3. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao and Leonidas Guibas ,Morgan Kauffman Publication,2004

| Subject: | ADVANCED OPERATING SYSTEM (ITPATP1) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective – I | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Course Objective**

The objective is to make the students understand the basic components of a computer operating system, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file Systems.

**Course Outcomes**

On successful completion of the course, the student will be able to:

1. Describe and explain the fundamental components of a computer operating system.
2. Define, restate, discuss, and explain the policies for scheduling, deadlocks, memory management, synchronization, system calls.
3. Define and explain the various aspects of file structure
4. Describe and explain the distributed system, topologies and design strategies
5. Conceptualize the Knowledge of the advanced operating systems

**Unit – I**

**Operating System**: Definition, Operating System as Resource Manager.

Types of Operating Systems: Simple Batch Processing, Multi-programmed Batch Processing, Time Sharing, Personal Computer systems, Parallel, Distributed and Real Time Operating Systems.

Operating System Components, Services, Calls, System Programs, Operating System Structure, Virtual Machines, System Design and Implementation.

Process Management: Concepts, Scheduling, Operations, Co-operating processes, Inter-process Communication.

Threads: Thread usage, threads in User Space, threads in Kernel, Hybrid Implementation, Scheduler Activation, Pop-up threads, Multithreading.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Algorithms, Multiple-processor Scheduling, Real Time Scheduling, Algorithm Evaluation.

**Unit – II**

**Process Synchronization**: Critical Section Problem, Synchronization Hardware, Semaphores Classical Problem of synchronization, Critical Regions, Monitors. System Calls like Signal Kill

**Deadlock:** Characteristics, Necessary Conditions, Prevention, Avoidance, Detection and Recovery.

Memory Management: Logical and Physical Address Space, Swapping

Contiguous Allocation: Single-partitioned, Multi-partitioned.

Non-contiguous Allocation: Paging, Segmentation, and Segmentation with Paging.

Virtual Memory: Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing, Demand Segmentation Over lays.

**Unit–III**

**File and Directory System**: File Concepts, Access Methods, Directory Structure, Protection, File system Structure, Allocation Methods, Free Space Management, Directory Implementation, Recovery. Secondary Storage Management: Disk Structure, Dedicated, Shared, Virtual, Sequential Access and Random Access Devices, Disk Scheduling, Disk Management, Swap-space Management, Disk Reliability, Stable Storage Management.

Protection and Security: Threats, Intruders, Accidental Data Loss, Cryptography, User Authentication, Attacks from inside the system, Attacks from outside the system, Protection Mechanism, Trusted Systems, Domain of Protection, Access Matrix, Programs Threats, System Threats. Computer Security Classification.

**Unit – IV**

Distributed systems, topology network types, design strategies.

Network operating structure, distributed operating system, remote services, and design issues. Distributed file system: naming and transparency, remote file access, Stateful v/s Stateless Service, File Replication. Basics at Network Operating System, Server Operating System & Real Time Operating System.

**Unit – V**

Distributed co-ordinations: Event Ordering, Mutual Exclusion, Atomicity, Concurrency Control, Deadlock

Handling, Election Algorithms, and Reaching Agreement.
Case studies of UNIX and MS-DOS operating system. Advanced Operating System.

**Text Book:**

| S.No | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Operating System Concepts | Silberschatz and Galvin | 8th | Addison Wesley publishing, Co.,1999 |
| 2 | Modern Operating Systems | Andrew S. Tanenbaum | 4th | Pearson Education |

**ReferenceBooks:**

| S. No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | An Introduction to Operating System | H. M. Dietel | 3rd | Pearson Education |
| 2 | Operating Systems | D. M. Dhamdhere | 2nd | Tata McGraw-Hill |
| 3 | Advanced Concepts in Operating Systems | Singhal | -- | Tata McGraw-Hill. |
| 4 | Operating Systems | William Stallings | 4th | Pearson Education |

| Subject: | DIGITAL FORENSICS (ITPATP2) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective – I | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Pre-Requisites:** Cybercrime and Information Warfare, Computer Networks

**Course Objectives:**

1. Providesanin-depthstudy oftherapidlychangingandfascinatingfieldof computerforensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digitalcrimes.
3. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discoverytools
4. E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

**Course Outcomes:** On completion of the course the student should be able to

1. Understand relevant legislation and codes ofethics.
2. Computer forensics and digital detective and various processes, policies andprocedures.
3. E-discovery, guidelines and standards, E-evidence, tools andenvironment.
4. Email and web forensics and networkforensics.

**UNIT - I**

**Digital Forensics Science**: Forensics science, computer forensics, and digital forensics.

**Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber- criminalistics area, holistic approach to cyber-forensics

**UNIT - II**

**Cyber Crime Scene Analysis:**

Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

**UNIT - III**

**Evidence Management & Presentation:**

Createandmanagesharedfoldersusingoperatingsystem,importanceoftheforensicmindset,define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probablecause.

**UNIT - IV**

**Computer Forensics:** Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case,

**Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.

**UNIT - V**

**Mobile Forensics:** mobile forensics techniques, mobile forensics tools.

**Legal Aspects of Digital Forensics: IT** Act 2000, amendment of IT Act 2008.

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

**References:**

1. John Sammons, The Basics of Digital Forensics,Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, LaxmiPublications

| Subject: | MOBILE APPLICATION DEVELOPMENT (ITPATP3) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective – I | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Prerequisites**

1. Acquaintance with JAVAprogramming
2. A Course on DBMS

**Course Objectives:**

1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To improves their skills of using Android software developmenttools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobiledevices
5. To demonstrate their ability to debug programs running on mobiledevices

**Course Outcomes:**

1. Student understands the working of Android OSPractically.
2. Student will be able to develop Android userinterfaces
3. Student will be able to develop, deploy and maintain the AndroidApplications.

**UNIT - I**

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

**UNIT - II**

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non-editableText Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

**UNIT - III**

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within anActivity

Notifications – Creating and Displaying notifications, Displaying Toasts

**UNIT - IV**

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

**UNIT - V**

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**Text Books:**

1. Professional Android 4 Application Dnetworkevelopment, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning,2013

**Reference:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

| Subject: | **MACHINE LEARNING (ITPATP4)** | Credits | | | |
|---|---|---|---|---|---|
| Type: | **Elective – I** | L | T | P | Total |
| Teaching Scheme: | **Lectures: 3 hours/week** | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOTnodes.
2. To design and analyses various machine learning algorithms and techniques with a modern outlook focusing on recentadvances.
3. Explore supervised and unsupervised learning paradigms of machinelearning.
4. To explore Deep learning technique and various feature extractionstrategies.

**Course Outcomes:** After completion of course, students would be able to:

1. Extract features that can be used for a particular machine learning approach in various IOT applications.
2. To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learningapproach.
3. To mathematically analyses various machine learning approaches andparadigms.

**UNIT - I**

**Supervised Learning (Regression/Classification)**

Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models.
Support Vector Machines, Nonlinearity and Kernel Methods.
Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

**UNIT – II**

**Unsupervised Learning:**

Clustering: K-means/Kernel K-means.
Dimensionality Reduction: PCA and kernel PCA.
Matrix Factorization and Matrix Completion.
Generative Models (mixture models and latent factor models).

**UNIT - III**

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

**UNIT - IV**

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

**UNIT - V**

Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.
Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

**References:**

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press,2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely availableonline)
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer,2007

| Subject: | NETWORK SECURITY(ITPATP5) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - II | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Pre-Requisites:** Computer Networks, Web Programming

**Course Objectives:**

1. To learn the basics of security and various types of securityissues.
2. To study different cryptography techniques available and various securityattacks.
3. Explore network security and how they are implemented in realworld.
4. To get an insight of various issues of Web security and biometricauthentication.

**Course Outcomes:** After completion of course, students would be able to:

1. To understand basics of security and issues related toit.
2. Understanding of biometric techniques available and how they are used in today'sworld.
3. Security issues in web and how to tacklethem.
4. Learn mechanisms for transport and networksecurity.

**UNIT – I**

**Data security:** Review of cryptography. Examples RSA, DES, ECC.

**UNIT –II**

Authentication, non-repudiation and message integrity.Digital signaturesand certificates.Protocols using cryptography (example Kerberos).Attacks on protocols.

**UNIT -III**

**Network security:** Firewalls, Proxy-Servers, Network intrusion detection.
**Transport security:** Mechanisms of TLS, SSL, IPSec.

**UNIT - IV**

Web security – SQL injection, XSS, etc. Software security and buffer overflow.

Malware types and case studies. Access Control, firewalls and host/network intrusion detection.

**UNIT - V**

Other topics: Biometric authentication, Secure E-Commerce (ex. SET), SmartCards, Security in Wireless Communication. Recent trends in IOT security, IDS and Biometric.

**References:**

1. W. R. Cheswick and S. M. Bellovin. Firewalls and Internet Security. Addison Wesley,1994.
2. W. Stallings. Cryptography and Network Security. Prentice Hall,1999.
3. B. Schneier. Applied Cryptography. Wiley,1999.

| Subject: | CLOUD COMPUTING (ITPATP6) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - II | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Pre-Requisites:** Computer Networks, Web Programming

**Course Objectives:**

1. The student will also learn how to apply trust-based security model to real-world security problems.
2. An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.
3. Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service deliverymodel.

**Course Outcomes:** After completion of course, students would be able to:

1. Identify security aspects of each cloudmodel
2. Develop a risk-management strategy for moving to theCloud
3. Implement a public cloud instance using a public cloud serviceprovider
4. Apply trust-based security model to differentlayer

**UNIT – I**

**Introduction to Cloud Computing:**

Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing

**UNIT – II**

**Cloud Computing Architecture:**

Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services DeliveryModel

**Cloud Deployment Models:**

Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise

**UNIT - III**

**Security Issues in Cloud Computing:**

Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security

**Identity and Access Management:**

Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

**UNIT - IV**

**Security Management in the Cloud**

Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS,IaaS

**Privacy Issues**

Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

**UNIT - V**

**Audit and Compliance**

Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud

**Advanced Topics**

Recent developments in hybrid cloud and cloud security.

**References:**

1. Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, Publication Date: November 2,2009.
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice), Tim Mather, ISBN-10: 0596802765, O'Reilly Media, September2009.

| Subject: | DATA MINING (ITPATP7) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - II | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To understand data miningconcepts.
2. To learn about various data preprocessingtechniques.
3. To learn about datawarehousing.
4. To learn about various data mining functionalities such as association rule mining, clustering, classification and outlier analysis.

**UNIT - I**

**Introduction:** Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Issues in Data Mining.

**Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

**UNIT - II**

**Data Warehouse and OLAP Technology for Data Mining:** Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Usage of Data Warehousing Online Analytical Processing and Mining

**Data Cube Computation**: Efficient Methods for simple Data Cube Computation (Full Cube, Iceberg Cube, Closed Cube and Shell Cube), Discovery Driven exploration of data cubes, Attribute-Oriented Induction for data characterization and its implementation

**UNIT - III**

**Mining Frequent Patterns, Associations and Correlations:** Basic Concepts, The Apriori algorithm for finding frequent itemsets using candidate generation, Generating association rules from frequent itemsets, Mining frequent itemsets without candidate generation, Mining various kinds of Association Rules, Correlation Analysis

**UNIT - IV**

**Classification and Prediction:** Description and comparison of classification and prediction,preparing data for Classification and Prediction.

Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation

Prediction, linear and non-linear regression, evaluating accuracy of a Classifier or a Predictor

**UNIT - V**

**Cluster Analysis:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, k-means and k-mediods methods, CLARANS, Agglomerative and divisive hierarchical clustering, chameleon dynamic modeling, DBSCAN, Grid based clustering method: STING, Conceptual Clustering, Constraint-Based Cluster Analysis, Outlier Analysis.

**Text Books:**

1. Data Mining – Concepts and Techniques - JiaweiHan, MichelineKamber and Jian Pei, 3rd edition, Morgan Kaufmann Publishers,ELSEVIER.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

**References:**

1. Data Warehousing in the Real World – Sam Aanhory& Dennis Murray Pearson EdnAsia.
2. Insight into Data Mining, K. P. Soman, S. Diwakar, V. Ajay, PHI,2008.
3. Data Warehousing Fundamentals – PaulrajPonnaiah Wiley studentEdition

4. The Data Warehouse Life cycle Tool kit – Ralph Kimball Wiley studentedition
5. Building the Data Warehouse By William H Inmon, John Wiley & Sons Inc,2005.
6. Data Mining Introductory and advanced topics –Margaret H Dunham, Pearsoneducation

| Subject: | DEEP LEARNING (ITPATP8) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - II | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To introduce the foundations of Artificial NeuralNetworks
2. To acquire the knowledge on Deep LearningConcepts
3. To learn various types of Artificial NeuralNetworks
4. To gain knowledge to apply optimizationstrategies

**Course Outcomes:**

1. Ability to understand the concepts of NeuralNetworks
2. Ability to select the Learning Networks in modeling real worldsystems
3. Ability to use an efficient algorithm for DeepModels
4. Ability to apply optimization strategies for large scaleapplications

**UNIT - I**

**Deep Feedforward Networks:** Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms, Historical Notes

**UNIT - II**

**Regularization for Deep Learning:**

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under- Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi- Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier.

**UNIT - III**

Optimization for Training Deep Models, How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta- Algorithms

**UNIT - IV**

**Convolutional Networks:**

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuro-scientific Basis for Convolutional Networks, Convolutional Networks and the History of DeepLearning

**UNIT - V**

**Applications:**

Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications

**Text Book:**

1. Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning (Adaptive Computation and Machine Learning series), MIT Press.

**Reference Books:**

1. Li Deng and Dong Yu, Deep Learning Methods and Applications, Foundations andTrends® in Signal Processing Volume 7 Issues 3-4, ISSN:1932-8346.
2. Dr. N.D. Lewis, Deep Learning Made Easy with R A Gentle Introduction for Data Science. Create Space Independent Publishing Platform (January 10,2016).
3. François Chollet, JJ Allaire, MEAP Edition Manning Early Access Program Deep Learning with R Version 1, Copyright 2017 ManningPublications.

| Subject: | ADVANCED ALGORITHMS (ITPBTT1) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Core | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Pre-Requisites:** UG level course in Algorithm Design and Analysis

**Course Objectives:**

1. Introduce students to the advanced methods of designing and analyzingalgorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
4. Students should be able to understand different classes of problems concerning their computationdifficulties.
5. To introduce the students to recent developments in the area of algorithmicdesign.

**Course Outcomes:** After completion of course, students would be able to:

1. Analyze the complexity/performance of differentalgorithms.
2. Determine the appropriate data structure for solving a particular set ofproblems.
3. Categorize the different problems in various classes according to theircomplexity.
4. Students should have an insight of recent activities in the field of the advanced datastructure.

**UNIT –I**

**Sorting:**

Review of various sorting algorithms, topological sorting

**Graph:**

Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

**UNIT – II**

**Matroids:**

Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

**Graph Matching:**

Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

**UNIT - III**

**Flow-Networks:**

Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

**Matrix Computations:**

Stassen’s algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

**UNIT - IV**

**Shortest Path in Graphs:**

Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.

**Modulo Representation of integers/polynomials:**
Chinese Remainder Theorem, Conversion between base-representation and modulo-representation.Extension to polynomials. Application: Interpolation problem.
**Discrete Fourier Transform (DFT):**
In complex field, DFT in modulo ring.Fast Fourier Transform algorithm.Schonhage-Strassen Integer Multiplication algorithm.

**UNIT - V**
**Linear Programming:**
Geometry of the feasibility region and Simplex algorithm
**NP-completeness:**
Examples, proof of NP-hardness and NP-completeness.
**One or more of the following topics based on time and interest:**
Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm
Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

**References:**
1. "Introduction to Algorithms" by Cormen, Leiserson, Rivest,Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft,Ullman.
3. "Algorithm Design" by Kleinberg andTardos.

| Subject: | ADVANCED COMPUTER ARCHITECTURE (ITPBTT2) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Core | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Prerequisites:** Computer Organization

**Course Objectives:**

1. To impart the concepts and principles of parallel and advanced computerarchitectures.
2. To develop the design techniques of Scalable and multithreadedArchitectures.
3. To Apply the concepts and techniques of parallel and advanced computer architectures to design modern computersystems

**Course Outcomes:** Gain knowledge of

1. Computational models and ComputerArchitectures.
2. Concepts of parallel computermodels.
3. Scalable Architectures, Pipelining, Superscalar processors,multiprocessors

**UNIT - I**

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multi-computers, Multi vector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

**UNIT - II**

Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

**UNIT - III**

Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, Shared- Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

**UNIT - IV**

Parallel and Scalable Architectures, Multiprocessors and Multi-computers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multi-computers, Message-passing Mechanisms, Multivetor and SIMD computers, Vector Processing Principals, Multi-vector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5,

**UNIT - V**

Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

**Text Book**

1. Advanced Computer Architecture, Kai Hwang, 2nd Edition, Tata McGraw HillPublishers.

**References:**

1. Computer Architecture, J.L. Hennessy and D.A. Patterson, 4th Edition,ELSEVIER.
2. Advanced Computer Architectures, S.G.Shiva, and Special Indian edition, CRC, Taylor&Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & FrancisGroup.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearsoneducation.
5. Computer Architecture, B. Parhami, Oxford Univ.Press.

| Subject: | WEB AND DATABASE SECURITY (ITPBTP1 ) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - III | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Pre-Requisites:** Database Management

**Course Objectives:**

1. Give an Overview of informationsecurity
2. Give an overview of Access control of relationaldatabases

**Course Outcomes**: Students should be able to

1. Understand the Web architecture andapplications
2. Understand client side and service sideprogramming
3. Understand how common mistakes can be bypassed and exploit theapplication
4. Identify common applicationvulnerabilities

**UNIT - I**

**The Web Security**

The Web Security Problem, Risk Analysis and Best Practices
Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

**UNIT - II**

**The Web Privacy**

The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

**UNIT - III**

**Database Security**

Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

**UNIT - IV**

**Security Re-engineering for Databases**

Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities

**UNIT - V**

**Future Trends Privacy in Database Publishing**

A Bayesian Perspective, Privacy-enhanced Location-based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

**Text Books:**

1. Web Security, Privacy and Commerce, Simson G. Arfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends, Michael Gertz, SushilJajodia.

| Subject: | INTERNET OF THINGS (ITPBTP2) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective- III | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To introduce the terminology, technology and itsapplications
2. To introduce the concept of M2M (machine to machine) with necessaryprotocols
3. To introduce the Python Scripting Language which is used in many IoTdevices
4. To introduce the Raspberry PI platform, that is widely used in IoTapplications
5. To introduce the implementation of web-based services on IoTdevices

**UNIT - I**

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs

IoTenabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates

Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

**UNIT - II**

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT

Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

**UNIT - III**

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

**UNIT - IV**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

**UNIT - V**

IoT Physical Servers and Cloud Offerings – 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

**Text Books:**

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN:9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson &Shawn Wallace, O'Reilly (SPD), 2014, ISBN:9789350239759

| Subject: | **DATA SCIENCE (ITPBTP3)** | Credits | | | |
|---|---|---|---|---|---|
| Type: | **Elective - III** | L | T | P | Total |
| Teaching Scheme: | **Lectures: 3 hours/week** | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. Provide you with the knowledge and expertise to become a proficient datascientist.
2. Demonstrate an understanding of statistics and machine learning concepts that are vital for datascience;
3. Produce Python code to statistically analyses adataset;
4. Critically evaluate data visualizations based on their design and use for communicating stories fromdata;

**Course Outcomes:** After completion of course, students would be able to:

1. Explain how data is collected, managed and stored for datascience;
2. Understand the key concepts in data science, including their real-world applications and the toolkit used by datascientists
3. Implement data collection and management scripts usingMongoDB

**UNIT – I**

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

**UNIT – II**

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data Sources

**UNIT-III**

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

**UNIT-IV**

Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

**UNIT-V**

Applications of Data Science, Technologies for visualization, Bokeh (Python).
Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

**References:**

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge UniversityPress.

| Subject: | HIGH PERFORMANCE COMPUTING (ITPBTP5) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - IV | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Prerequisites:** Computer Organization & Architecture, Operating System Programming

**Course Objectives:**

1. To Improve the systemperformance
2. To learn various distributed and parallel computingarchitecture
3. To learn different computingtechnologies

**Course Outcomes:**

1. Understanding the concepts in gridcomputing
2. Ability to set up cluster and run parallelapplications
3. Ability to understand the cluster projects and clusterOS
4. Understanding the concepts of pervasive computing & quantumcomputing.

**UNIT - I**

Grid Computing: Data & Computational Grids, Grid Architectures And Its Relations To Various Distributed Technologies. Autonomic Computing, Examples Of The Grid Computing Efforts (Ibm).

**UNIT - II**

Cluster Setup & Its Advantages, Performance Models & Simulations; Networking Protocols & I/O, Messaging Systems. Process Scheduling, Load Sharing And Balancing; Distributed Shared Memory, Parallel I/O.

**UNIT - III:**

Example Cluster System – Beowulf; Cluster Operating Systems: Compas And Nanos Pervasive Computing Concepts & Scenarios; Hardware & Software; Human – Machine Interface.

**UNIT - IV**

Device Connectivity; Java For Pervasive Devices; Application Examples.

**UNIT - V**

Classical Vs Quantum Logic Gates; One, Two & Three Qubit Quantum Gates; Fredkin&Toffoli Gates; Quantum Circuits; QuantumAlgorithms.

**Text Book:**

1. “Selected Topics In Advanced Computing” Edited By Dr. P. Padmanabham And Dr. M.B. Srinivas, 2005 Pearson Education.

**References:**

1. J. Joseph & C. Fellenstien: ‘Grid Computing ‘, PearsonEducation
2. J. Burkhardt et.al: ‘pervasive computing’ PearsonEducation
3. Marivesar:’ Approaching quantum computing’, PearsonEducation.
4. Raj kumarBuyya:’High performance cluster computing’, PearsonEducation.
5. Neilsen& Chung L:’Quantum computing and Quantum Information’, Cambridge University Press.
6. A networking approach to Grid Computing, Minoli,Wiley.

| Subject: | CYBER SECURITY (ITPBTP6) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - IV | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To learn about cyber-crimes and how they areplanned.
2. To learn the vulnerabilities of mobile and wirelessdevices.
3. To learn about the crimes in mobile and wirelessdevices.

**UNIT - I**

**Introduction to Cybercrime:** Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

**Cyber offenses: How criminals Plan Them:** Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**UNIT- II**

**Cybercrime: Mobile and Wireless Devices:** Introduction, Proliferation of Mobile and Wireless 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 an Measures in Mobile Computing Era, Laptops.

**UNIT - III**

**Cybercrimes and Cyber security: the Legal Perspectives**

Introduction, Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyber law, Technology and Students: Indian Scenario.

**UNIT - IV**

**Understanding Computer Forensics**

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing

**UNIT - V**

**Cyber Security: Organizational Implications**

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges forOrganizations.

**Text Books:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, WileyINDIA.

2. Introduction to Cyber Security**,** Chwan-Hwa(john) Wu, J. David Irwin. CRC Press T & F Group.

**Reference Book:**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC

| Subject: | ADVANCED COMPUTER NETWORKS (ITPBTP7) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - IV | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Prerequisites:** Data Communication, Basic Networking Principles

**Course Objective:**

1. This course aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computernetworks.

**Course Outcomes:**

1. Understanding of holistic approach to computernetworking
2. Ability to understand the computer networks and theirapplication
3. Ability to design simulation concepts related to packet forwarding innetworks.

**UNIT - I**

Review of Computer Networks, Devices and the Internet: Internet, Network edge, Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss in Packet- Switched Networks, Networking and Internet - Foundation of Networking Protocols: 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing.

Multiplexers, Modems and Internet Access Devices, Switching and Routing Devices, Router Structure. The Link Layer and Local Area Networks-Link Layer, Introduction and Services, Error- Detection and Error-Correction techniques, Multiple Access Protocols, LinkLayer

Addressing, Ethernet, Interconnections: Hubs and Switches, PPP: The Point-to-Point Protocol, Link Virtualization

**UNIT - II**

Data-link protocols: Ethernet, Token Ring and Wireless (802.11). Wireless Networks and Mobile IP: Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs), Multiple access schemes Routing and Internetworking: Network–Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intra-domain Routing Protocols, Inter-domain Routing Protocols, Congestion Control at Network Layer.

**UNIT - IV**

Transport and Application Layer Protocols: Client-Server and Peer-To-Peer Application Communication, Protocols on the transport layer, reliable communication. Routing packets through a LAN and WAN. Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control. Principles of Network Applications,

**UNIT - V**

The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, building a Simple Web Server Creating simulated networks and passing packets through them using different routing techniques. Installing and using network monitoring tools.

**Text books:**

1. Computer Networking: A Top-Down Approach, James F. Kuros and Keith W. Ross, Pearson, 6th Edition,2012.
2. Computer Networks and Internets, Duglas E. Comer, 6th Edition,Pearson.

**References:**

1. A Practical Guide to Advanced Networking, Jeffrey S. Beasley and PiyasatNilkaew, Pearson, 3rd Edition,2012
2. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, PrenticeHall.

| Subject: | BIG DATA ANALYTICS (ITPBTP8) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Elective - IV | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To understand about bigdata
2. To learn the analytics of BigData
3. To Understand the Map Reduce fundamentals

**UNIT - I**

Big Data Analytics: What is big data, History of Data Management; Structuring Big Data; Elements of Big Data; Big Data Analytics; Distributed and Parallel Computing for Big Data;

Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source AnalyticsTools;

**UNIT - II**

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;

Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

**UNIT - III**

Understanding MapReduce Fundamentals and HBase : The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBasein Big Data Processing; Storing Data in Hadoop : Introduction of HDFS, Architecture, HDFC Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBasein Operations- Programming with HBase; Installation, Combining HBaseandHDFS;

**UNIT - IV**

Big Data Technology Landscape and Hadoop: NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors; HDFC (Hadoop Distributed File System), HDFC Daemons, read, write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN.

**UNIT - V**

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining onTweets;

Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools;

**Text Books:**

1. Big Data and Analytics, SeemaAcharya, SubhasininChellappan, Wileypublications.
2. Big Data, Black Book™ ,DreamTech Press, 2015Edition.
3. Business Analytics 5e , BY Albright|Winston

**Reference Books:**

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence –Practice, Technologies and Management", John Wiley2011.
2. Lariss T. Moss, ShakuAtre, "Business Intelligence Roadmap", Addison-Wesley ItService.
3. YuliVasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff,2012.

| Subject: | ADVANCED ALGORITHMS LAB (Lab - II) (ITPBLT1) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Practical | L | T | P | Total |
| Teaching Scheme: | Lectures: 4 hours/week | 0 | 0 | 4 | 2 |

**Course Objective:** The student can able to attain knowledge in advance algorithms.
**Course Outcomes:** The student can able to analyze the performance of algorithms

**List of Experiments**

1. Implement assignment problem using Brute Forcemethod
2. Perform multiplication of long integers using divide and conquermethod.
3. Implement solution for knapsack problem using Greedymethod.
4. Implement Gaussian eliminationmethod.
5. Implement LUdecomposition
6. Implement Warshall algorithm
7. Implement Rabin Karp algorithm.
8. Implement KMP algorithm.
9. Implement Harspool algorithm
10. Implement max-flowproblem.

**Text Book:**

1. Design and Analysis of Algorithms, S.Sridhar, OXFORD University Press

**References:**

1. Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C.Stein,PHI Pvt. Ltd./ PearsonEducation.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahniand Rajasekharam, UniversitiesPress.
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearsoneducation.

| Subject: | DATA SCIENCE LAB (Lab – III) (ITPBLT2) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Practical | L | T | P | Total |
| Teaching Scheme: | Lectures: 4 hours/week | 0 | 0 | 4 | 2 |

**Course Objectives:**

1. To make students understand learn about a Big Data – R Programming, way of solving problems.
2. To teach students to write programs in Scala to solve problems.

**Introduction to R Programming:**

What is R and RStudio? R is a statistical software program. It has extremely useful tools for data exploration, data analysis, and data visualization. It is flexible and also allows for advanced programming. RStudio is a user interface for R, which provides a nice environment for working with R.

| | |
|---|---|
| 1. | Write an R program to evaluate the following expression ax+b/ax-b. |
| 2. | Write an R program to read input from keyboard (hint: readLine()). |
| 3. | Write an R program to find the sum of n natural numbers: 1+2+3+4+….n |
| 4. | Write an R program to read n numbers.<br>(i) Sum of all even numbers (ii) Total number of even numbers. |
| 5. | Write an R program to read n numbers.<br>(i) Total number of odd numbers (ii) Sum of all odd numbers |
| 6. | Write an R program to obtain<br>(i)sum of two matrices A and B (ii) subtraction of two matrices A and B<br>(iii) Product of two matrices. |
| 7. | Write an R program for “declaring and defining functions “ |
| 8. | Write an R program that uses functions to add n numbers reading from keyboard |
| 9. | Write an R program uses functions to swap two integers. |
| 10. | Write an R program that use both recursive and non-recursive functions for implementing the Factorial of a given number, n. |
| 11. | Write an R program to reverse the digits of the given number {example 1234 to be written as 4321} |
| 12. | Write an R program to implement<br>(i)Linear search (ii) Binary Search. |
| 13. | Write an R program to implement<br>(i)Bubble sort (ii) selection sort. |
| 14. | Write a R program to implement the data structures<br>(i) Vectors (ii) Array (iii) Matrix (iv) Data Frame (v) Factors |
| 15. | Write a R program to implement scan(), merge(), read.csv() and read.table() commands. |
| 16. | Write an R program to implement “Executing Scripts” written on the note pad, by calling to the R console. |
| 17. | Write a R program, Reading data from files and working with datasets<br>(i) Reading data from csvfiles, inspection ofdata.<br>(ii) Reading data from Excelfiles. |
| 18. | Write a R program to implement Graphs<br>(i) Basic high-level plots (ii)Modifications of scatter plots<br>(iii) Modifications of histograms, parallel boxplots.<br><br>Suggested Books for Lab:<br>1. Big data – Black Book: 2015 edition: dreamtechpress. Pg. (490-642)<br>2. Introducing to programming and problem solving by scala, mark c. lewis, lisal.lacher. |

| | |
|---|---|
| | CRC press, second edition.<br><br>Suggested Links:<br>1. https://www.tutorialspoint.com/scala/<br>2. https://www.tutorialspoint.com/r/ |

| Sub Title: ENTERPRISE RESOURCE MANAGEMENT | | |
|---|---|---|
| **Sub Code: CSPBTO9** | **No. of Credits : 3=3: 0: 0(L-T-P)** | **No of lecture hours/week :03** |
| **Exam Duration : 3 hours** | **IA+ESE=40+60** | **Total no of contact hours:36** |

**COURSE OBJECTIVE:**

1. To discuss the fundamental concepts an enterprise and its integration of major functions
2. To discuss the various technologies used for an ERP.
3. To discuss importance of information in an organization.
4. To discuss Material resource management, forecasting and job scheduling
5. To discuss Software implementation methods and various other related issues

| UNIT No | Syllabus Content | No of Hours |
|---|---|---|
| 1 | **Function of Business Organizations:** Personnel management, Financial management, marketing management, Sales order Processing , Manufacturing managements , Human Resource Management etc , data and information , Operation of functional areas. Integrated view of ERP | 8 |
| 2 | **Technologies of ERP:** knowledge based system , Decision support system , Executive information system , Electronic commerce, , Databases system , Business Engineering , Business process Engineering , Networking , 3 tier and 2 tier architecture. | 7 |
| 3 | **Management information system:** MIS, data & information, levels of Management , information requirement , objectives of information channels, information strategies | 7 |
| 4 | **Information and planning:** Resource management benefit of management planning process objective and its characteristic , policy and procedures ,forecasting and its varies aspects . Scheduling , MRP , MRP-II | 7 |
| 5 | **ERP implement issues:** software development life cycle , pre Evaluation schemes , post implement issues, case studies . | 7 |

**COURSE OUTCOMES:** The students would have learnt

CO1: Basic concepts of an enterprise functions and its integration for ERP. CO2: Introduction of different technologies related to ERP.
CO3: Importance of an information for all levels of organization.
CO4: Concepts of ERP for the manufacturing perspective
CO5: The implementation strategies of the ERP life cycle

Text Books:

1. Enterprise resource planning by Alixis Leon TMH
2. Management

Information System by

Jawardekar Reference Books:


1. Kinematics and Synthesis of linkages –Hartenberg and Denavit– McGrew Hill Book Co
2. ERP by Garg and Ravichandran
3. Management Information Systems : Louden & Louden
4. Information System and MIS : J Kanter


## Course Outcomes and their mapping with Programme Outcomes:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **1** | **1** | **3** | **2** | **1** | **1** | **3** | **1** | **1** | **1** | **0** | **3** | **3** | **2** | **2** |
| **CO2** | **1** | **3** | **3** | **2** | **3** | **1** | **2** | **1** | **1** | **2** | **0** | **3** | **3** | **3** | **2** |
| **CO3** | **2** | **1** | **3** | **2** | **1** | **1** | **1** | **2** | **2** | **2** | **2** | **3** | **3** | **1** | **2** |
| **CO4** | **2** | **1** | **3** | **2** | **1** | **1** | **3** | **1** | **1** | **1** | **0** | **3** | **3** | **1** | **2** |
| **CO5** | **1** | **1** | **3** | **1** | **3** | **1** | **3** | **1** | **3** | **1** | **2** | **3** | **1** | **2** | **2** |

**Weightage: 1-Sightly; 2-Moderately; 3-Strongly**

| Subject: | SOFTWARE ENGINEERING TECHNIQUES (ITPBTO9) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Open Elective | L | T | P | Total |
| Teaching Scheme: | Lectures: 3 hours/week | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. Knowledge of basic SW engineering methods and practices, and their appropriate application.
2. Describe software engineering layered technology and Process frame work.
3. A general understanding of software process models such as the waterfall and evolutionary models.
4. Understanding of software requirements and the SRS documents.
5. Understanding of the role of project management including planning, scheduling, risk management, etc.

**Course Outcomes:** After completion of course, students would be able to:

1. Basic knowledge and understanding of the analysis and design of complex systems.
2. Ability to apply software engineering principles and techniques.
3. Ability to develop, maintain and evaluate large-scale software systems.
4. to produce efficient, reliable, robust and cost-effective software solutions.
5. Ability to perform independent research and analysis.

**UNIT – I**

**Introduction to Software Engineering:**

Introduction, Total Effort devoted to Software, Distribution of Effort, Project size Categories, Quality and Productivity Factors, Managerial Issues.

**Planning a Software Project:**

Goals and Requirements, Developing a Solution Strategy, The Phased Life-Cycle Model, Milestones, Documents, and Reviews, The Cost Model, The Prototype Life-Cycle Model, Successive Versions, Planning an Organizational Structure, Planning for Configuration Management and Quality Assurance, Planning for Independent Verification and Validation, Planning Phase-Dependent Tools and Techniques.

**UNIT – II**

**Software Cost Estimation:**

Software Cost Factors, Software Cost Estimation Techniques, Expert Judgment, Delphi Cost Estimation, Work Breakdown Structure, Algorithmic Cost Models, Staffing Level Estimation, Estimating Software Maintenance Costs.

**Software Requirements Definition:**

The Software Requirements Specification, Formal Specification Techniques : Relational Notations - Implicit Equations/Recurrence Relations/Algebraic Axioms/ Regular Expressions; State-Oriented Notations - Decision Tables/ Event Tables / Transition Tables /Finite-state Mechanisms/Petri Nets.

**UNIT – III**

**Software Design:**

Fundamental Design Concepts, Modules and Modularization Criteria, Design Notations, Design Techniques, Detailed Design Considerations, Real-Time and Distributed System Design, Test Plans, Milestones, Walkthroughs, and Inspections, Design Guidelines.

**UNIT – IV**

**Implementation Issues:**

Structured Coding Techniques, Coding Style, Standards and Guidelines, Documentation Guidelines.

**Modern Programming Language Features:**

Type Checking, User Defined Date Types, Data Abstraction, Scoping Rules, Exception Handling.

**UNIT –V**

**Verification and Validation Techniques:**

Quality Assurance, Walkthroughs and Inspections, Unit Testing and Debugging, System Testing.

**Software Maintenance:**

Enhancing Maintainability during Development, Managerial Aspects of Software Maintenance, Configuration Management, Source-Code Metrics

**Text Books:**


1. R. Fairley, “Software Engineering Concepts”, Tata McGraw Hill, 1997.
2. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 5th ed., McGraw Hill Int. Ed., 2001.
3. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001.


**References:**


4. P. Jalote, “An Integrated approach to Software Engineering”, Narosa, 1991.
5. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
6. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons
7. Sommerville, “Software Engineering ”, 6th ed. Pearson Education, 2002.

| Subject: | WIRELESS SENSOR NETWORK LAB<br>(Lab - I) (ITPALT2) | Credits | | | |
|---|---|---|---|---|---|
| Type: | Practical | L | T | P | Total |
| Teaching Scheme: | Lectures: 4 hours/week | 0 | 0 | 2 | 2 |

**Prerequisites:** A course on Computer Network.

**Course Objectives:**

1. To provide in depth knowledge of sensors
2. To introduce the students the upcoming challenges of WSN
3. To give a fundamental knowledge on the basic laws and phenomena on which operation of sensor transformation of energy is based.
4. To impart a reasonable level of competence in the design, construction, and deployment of sensors.

**Course Outcomes:**

1. Implementation of WSN.
2. Critical areas of WSN.
3. Deployment of WSN.
4. Research issues in WSN.

**List of Programs**

1. Perform Installation of NS2 simulator in Linux OS.
2. Perform Simulation in NSG (NS-2 Scenario Generator).
3. Create a scenario of 50 Nodes to study the performance of AODV, DSDV and DSR Routing Protocols through NS2 simulation.
4. Create a scenario of 100 Nodes to study the performance of AODV, DSDV and DSR Routing Protocols through NS2 simulator.
5. Create a scenario of 150 Nodes to study the performance AODV, DSDV and DSR Routing Protocols through NS2 simulator.
6. Perform Installation and Configuration of Cup Carbon Simulator.
7. Create a environment using Mobility Sensor and marker in cup Carbon to detect the intruders in any system.
8. Write a program to perform communication between two or more sensors using Cup Carbon.
9. Perform Installation and Configuration of Contiki/Cooja Simulator.
10. Implement RPL protocol in Cooja Simulator.
11. Implement Client Server Model in Cooja Simulator.

**TEXT BOOKS:**


1. Wireless Sensor and Actuator Networks Algorithms and Protocols for Scalable Coordination and Data Communication, Edited by AmiyaNayak and Ivan Stojmenovic A JOHN WILEY & SONS, INC., PUBLICATION,2010.
2. Wireless Communications & Networks, 2nd Edition, William Stallings ,Pearson Education India,2009 3. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao and Leonidas Guibas ,Morgan Kauffman Publication,2004.