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| **KERALA TECHNOLOGICAL UNIVERSITY**  http://ktu.edu.in/images/logo_final.png  **SCHEME AND SYLLABUS**  **FOR**  **M. Tech. DEGREE PROGRAMME**  **IN**  **COMPUTER SCIENCE AND ENGINEERING**  **WITH SPECIALIZATION**  **COMPUTER SCIENCE AND INFORMATION SYSTEMS**  **CLUSTER 05 (ERNAKULAM II)**  **KERALA TECHNOLOGICAL UNIVERSITY CET Campus, Thiruvananthapuram Kerala, India -695016**  **(2015 ADMISSION ONWARDS)** |

**KERALA TECHNOLOGICAL UNIVERSITY**

**SCHEME AND SYLLABUS FOR M. Tech. DEGREE PROGRAMME**

**Branch: COMPUTER SCIENCE AND ENGINEERING**

**Specialization: COMPUTER SCIENCE AND INFORMATION SYSTEMS**

**SEMESTER – I**

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| **Exam Slot** | **Course No** | **Subjects** | **L-T-P** | **Internal**  **Marks** | **End Semester Exam** | | **Credits** |
| **Marks** | **Duration(hrs)** |
| A | 05CS6101 | Mathematical Foundations for Computer Science | 3-1-0 | 40 | 60 | 3 | 4 |
| B | 05CS6103 | Advanced Data Structures and Algorithms | 3-1-0 | 40 | 60 | 3 | 4 |
| C | 05CS6105 | Computer Security and Applied Cryptography | 3-1-0 | 40 | 60 | 3 | 4 |
| D | 05CS6107 | Object Oriented Software Engineering | 2-1-0 | 40 | 60 | 3 | 3 |
| E | 05CS611X | Elective I | 2-1-0 | 40 | 60 | 3 | 3 |
|  | 05CS6177 | Research Methodology | 0-2-0 | 100 | 0 | 0 | 2 |
|  | 05CS6191 | CASE Lab | 0-0-2 | 100 | 0 | 0 | 1 |

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| **Course No** | **Subjects** |
| 05CS6111 | Wireless Sensor Networks |
| 05CS6113 | Image processing |
| 05CS6115 | Software Architecture |

**SEMESTER – II**

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| **Exam Slot** | **Course No** | **Subjects** | **L-T-P** | **Internal**  **Marks** | **End Semester Exam** | | **Credits** |
| **Marks** | **Duration(hrs)** |
| A | 05CS6102 | Modern Databases  Management | 3-1-0 | 40 | 60 | 3 | 4 |
| B | 05CS6104 | Advanced Computer  Networks | 2-1-0 | 40 | 60 | 3 | 3 |
| C | 05CS6106 | Operating System  Design Concepts | 2-1-0 | 40 | 60 | 3 | 3 |
| D | 05CS612X | Elective II | 2-1-0 | 40 | 60 | 3 | 3 |
| E | 05CS613X | Elective III | 2-1-0 | 40 | 60 | 3 | 3 |
|  | 059CS6166 | Seminar-I | 0-0-2 | 100 | 0 | 0 | 2 |
|  | 05CS6188 | Mini project | 0-0-4 | 100 | 0 | 0 | 2 |
|  | 05CS6192 | Network Systems Lab  Lab | 0-0-2 | 100 | 0 | 0 | 1 |

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| **Course No** | **Subjects** |
| 05CS6122 | Principles of Real Time Systems |
| 05CS6124 | Software Project Management |
| 05CS6126 | Grid Computing |

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| **Course No** | **Subjects** |
| 05CS6132 | Software Testing |
| 05CS6134 | Principles of Network Security |
| 05CS6136 | Information Theory and Coding |

**SEMESTER – III**

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| ***Exam***  ***Slot*** | ***Course***  ***No*** | ***Subjects*** | ***L-T- P*** | ***Internal***  ***Marks*** | ***End Semester Exam*** | | ***Credits*** |
| Marks | Duration(hrs) |
| A | 05CS714X | Elective IV | 2-1-0 | 40 | 60 | 3 | 3 |
| B | 05CS715X | Elective V | 2-1-0 | 40 | 60 | 3 | 3 |
|  | 05CS7167 | Seminar-II | 0-0-2 | 100 | 0 | 0 | 2 |
|  | 05CS7187 | Project -Phase1 | 0-0-8 | 50 | 0 | 0 | 6 |

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| **Course No** | **Subjects** |
| 05CS7141 | Data Warehousing and Data Mining |
| 05CS7143 | Cloud Computing |
| 05CS7145 | Agent Based Intelligent Systems |

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| **Course No** | **Subjects** |
| 05CS7151 | Advanced Information Security Concepts |
| 05CS7153 | Multi Core Architecture |
| 05CS7155 | Design and Analysis of Algorithms |

**SEMESTER – IV**

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| **Exam**  **Slot** | **Course No** | **Subjects** | **L-T-P** | **Internal**  **Marks** | **End Semester Exam** | | **Credits** |
| **Marks** | **Duration(hrs)** |
|  | 05CS7188 | Project -Phase 2 | 0-0-21 | 70 | 30 | 0 | 12 |

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Total:68

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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6101 | | MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE | 3-1-0-4 | 2015 | |
| COURSE OBJECTIVES:   * The objective of this course is to present the foundations of many basic computer related concepts and provide a coherent development to the students for the courses like Fundamentals of Computer Organization, RDBMS, Data Structures, Analysis of Algorithms, Theory of Computation ,Cryptography, Artificial Intelligence and others. This course will enhance the student’s ability to think logically and mathematically.  COURSE OUTCOMES:  * At the end of the course, the student should be able to formulate logic expressions for a variety of applications; convert a logic expression into a Boolean circuit, and vice versa; design relational databases; design finite automata to recognize string patterns; apply, adapt, and design elementary deterministic and randomized algorithms to solve computational problems; analyze the running time of non-recursive algorithms with loops by means of counting; analyze the running time of divide-and-conquer recursive algorithms by means of recurrence equations; and use trees and graphs to formulate computational problems. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Introduction to Information Theory**  Concept of amount of information-Entropy-Joint and Conditional Entropy-Relative Entropy-Mutual information-Relationship between Entropy and Mutual information-Rate of information-Channel capacity-Redundancy and efficiency of channels – Huffman Codes – Hidden Markovian Models | | | | 9 |
| **INTERNAL TEST 1(Module 1)** | | | | | |
| **II** | **Mathematical Preliminaries of Neural Networks**  Linear Algebra – Linear transformation – matrices & operations – eigenvalues and eigenvectors – expectation – covariance matrices – Vector Algebra – Vector spaces – vector products &orthogonality – Cauchy Schwarz Inequality – Cosine similarity – Function continuity and monotonic functions. | | | | 9 |
| **INTERNAL TEST 2(Module 2)** | | | | | |
| **III** | **Fuzzy Sets**  Crisp sets and Fuzzy sets-, α-cuts, Convex fuzzy sets, Fuzzy cardinality, Algebra of fuzzy sets, Standard fuzzy set operations-(complement, union and intersection), Yager and Sugeno classes. Crisp relations and Fuzzy relations, Operations on Fuzzy relations. Fuzzy Cartesian product. Fuzzy Equivalence relations and similarity relations. | | | | 10 |
| **IV** | **Mathematics in Networking and Security**  Mathematical Foundations of Cryptography : Modulo arithmetic – Additive and multiplicative inverses of natural numbers under modulo arithmetic - Euler's theorem & Fermat's theorem – Chinese Remainder theorem – Linear and affine ciphers – Fiestel cipher structure – Integer factorization & Discrete Logarithm problems – Elliptic curve cryptography – Extension Fields - Kronecker's theorem – Galois field, Queuing and Scheduling Models : General concepts, Arrival pattern, service pattern, Queue Disciplines - Queues in Wireless nodes – DropTail, RED, SFQ queuing models[6,7,8,11,12], Case Study : Completely Fair Scheduler in Linux [10,13,14]. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. R Bose, “Information Theory, Coding and Cryptography”, TMH 2007 2. Satish Kumar “Neural Networks: A classroom Approach”, The McGraw-Hill Companies. 3. J Gilbert, L Gilbert, “Linear Algebra and Matrix Theory”, Academic Press, Elsevier 4. George J Klir and Bo Yuan, ”Fuzzy sets and Fuzzy logic” Prentice-Hall of India,1995 5. William Stallings, “Cryptography and network security- principles and practice”, 3rd Edition, Pearson Prentice Hall. 6. Douglas Comer, “Internetworking with TCP IP Vol.1: Principles, Protocols, and Architecture”, Prentice Hall 7. George Varghese, “Network Algorithmics: An Interdisciplinary Approach to Designing Fast Networked Devices”, Elsevier, 2004 8. Michael Welzl, “Network Congestion Control – managing internet traffic”, John Wiley & Sons | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6103 | | **ADVANCED DATA STRUCTURES AND ALGORITHMS** | 3-1-0-4 | 2015 | |
| COURSE OBJECTIVES:   * Analyze the asymptotic performance of algorithms. * Write rigorous correctness proofs for algorithms. * Demonstrate a familiarity with major algorithms and data structures. * Apply important algorithmic design paradigms and methods of analysis.  COURSE OUTCOMES:  * Analyze the asymptotic performance of algorithms. * Write rigorous correctness proofs for algorithms. * Demonstrate a familiarity with major algorithms and data structures. * Apply important algorithmic design paradigms and methods of analysis. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Trees –Threaded Binary Trees, Selection Trees, Forests and binary search trees, Counting Binary Trees, Red-Black Trees, Splay Trees, Suffix Trees, Digital Search Trees, Tries- Binary Tries, Multiway Tries. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | Priority Queues **-** Single and Double Ended Priority Queues, Leftist Trees, Binomial Heaps, Fibonacci Heaps, Pairing Heaps, Symmetric Min-Max Heaps, Interval Heaps. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Graph models and algorithms– Random graphs, Visibility graphs – Graph based models for Search in AI, Bioinformatics, Social Networks  Sampling, sketching, data stream models, read-write streams, stream-sort, map-reduce – Algorithms in evolving data streams | | | | 10 |
| **IV** | **Mathematics in Networking and Security**  Maximum Flow**-**Flow Networks, Ford-Fulkerson method-analysis of Ford-Fulkerson, Edmonds-Karp algorithm, Maximum bipartite matching  Computational Geometry**-** Line segment properties, Finding the convex hull **,**Finding the closest pair of points. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Ellis Horowitz, SartajSahni, Susan Anderson Freed, Fundamentals of Data Structures in C, Second Edition, University Press, 2008 2. YedidyahLangsam, Moshe J. Augenstein, Aaron M. Tenenbaum, Data Structures using C and C++, Second Edition, PHI Learning Private Limited, 2010 3. Thomas Cormen, Charles E. Leiserson, Ronald Rivest, Introduction to algorithm,3rd edition, PHI Learning 4. Ellis Horowitz and SartajSahni, SanguthevarRajasekaran, Fundamentals of Computer Algorithms,Universities Press, 2nd Edition, Hyderabad . 5. Sara Baase& Allen Van Gelder ,Computer Algorithms – Introduction to Design and Analysis, Pearson Education.. 6. Data Streams: Algorithms and Applications: S. Muthukrishnan, Now Publishers 7. Data Streams: Models and Algorithms: Charu C. Aggarwal, Springer 8. Algorithm Design: Jon Kleinberg and Eva Tardos, Addison Wesley 9. Anany V. Levitin. Introduction to the Design & Analysis of Algorithms (2nd Ed): Addison Wesley. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6105 | | **COMPUTER SECURITY AND APPLIED CRYPTOGRAPHY** | 3-1-0-4 | 2015 | |
| COURSE OBJECTIVES:   * To understand the fundamentals of Cryptography * To acquire knowledge on standard algorithms used to provide confidentiality, integrityand authenticity. * To understand the various key distribution and management schemes. * To design security applications in the field of Information technology.  COURSE OUTCOMES:  * Upon completion of the course, the students will be able to * Implement basic security algorithms required by any computing system. * Analyze the vulnerabilities in any computing system and hence be able to design a   security solution.   * Analyze the possible security attacks in complex real time systems and their effective countermeasures | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | An Overview of Computer Security-Security Services-Security Mechanisms-Security Attacks Classical Cryptography-The Shift Cipher,The Substitution Cipher,The Affine Cipher Cryptanalysis-Cryptanalysis of the Affine Cipher,Cryptanalysis of the Substitution Cipher,Cryptanalysis of the VigenereCipher,Shannon’s Theory. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | The RSA Cryptosystem and Factorin Integer- Intoduction to Public –key Cryptography, Number theory,The RSA Cryptosystem ,Other Attacks on RSA,TheELGamalCryptosystem,Shanks’ Algorithm,FinitFields,Elliptic Curves over the Reals, Elliptical Curves Modulo a Prime,Signature Scheme –Digital Signature Algorithm. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Identification Scheme and Entity Attenuation-Challenge – and – Response in the Secret-key Setting,Challenge – and – Response in the Public key Setting,TheSchnorrIdentificataonScheme,Key distribution-Diffie-Hellman Key, Predustribution,Unconditionaly Secure key Predistribution,Key Agreement Scheme- Diffie-Hellman Key agreement,Public key infrastructure-PKI,Certificates,Trust Models. | | | | 10 |
| **IV** | Secret Sharing Schemes-The Shamir Threshold Scheme,Access Structure and General Scret key sharing,Informataion Rate and Construction of EffcientSchemes,MulticastSecuruty and Copyright production-Multicast Security,Braodcast Encryption ,Multicast Re-keying,Copyright Protection ,Tracing Illegally Redistribution keys. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Douglas R. Stinson ,“Cryptography Theory and Practice ”, Third Edition, Chapman &   Hall/CRC,2006   1. Menges A. J , Oorschot P, Vanstone S.A,“Handbollk of Appliled Cryptography”   CRC Press,1997   1. William Stallings, “Cryptography and Network Security: Principles and Practices”,   Third Edition, Pearson Education,2006.   1. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education,First Edition, 2006. 2. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Fourth   Edition, Pearson Education, 2007.  14   1. Wade Trappe and Lawrence C. Washington, “Intrduction to Cryptography with   Coding Theory” Second Edition, Pearson Education, 2007. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6107 | | **OBJECT ORIENTED SOFTWARE ENGINEERING** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To learn and understand various O-O concepts along with their applicability contexts. * How to identify and model/represent domain constraints on the objects. * Develop design solutions for problems on various O-O concepts.  COURSE OUTCOMES:  * Study a body of knowledge relating to Software Engineering, Software reengineering, and maintenance.   Understand the principles of large scale software systems, and the processes that are used to build them. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Study a body of knowledge relating to Software Engineering, Software reengineering, and maintenance.  Understand the principles of large scale software systems, and the processes that are used to build them | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | Requirements Elicitation – Requirement Documentation-Use Cases- Unified Modeling language- Introduction, UML Diagrams – Class diagrams, Sequence diagrams, Object diagrams, Deployment diagrams, Use case diagrams, State diagrams, Activity diagram, Component diagrams – Case Study- Identifying Classes- Noun Phrase Approach, Common class Pattern Approach, Use-Case Driven Approach, CRC. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Analysis Object Model (Domain Model) – Analysis Dynamic Models- Non-functional requirements – Analysis Patterns. System Design Architecture – Design Principles – Design Concepts -Design Patterns – Architectural Styles-Dynamic Object Modeling – Static Object Modeling – Interface Specification – Object Constraint Language. | | | | 10 |
| **IV** | Mapping Design (Models) to Code – Model Transformation- Refactoring- Mapping Associations- Mapping Activities- Testing- Configuration Management – Maintenance process- System documentation – program evolution dynamics | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Bernd Bruegge, Alan H Dutoit, “Object-Oriented Software Engineering” Second edition, Pearson Education, 2004. 2. Craig Larman, “Applying UML and Patterns” Third edition, Pearson Education, 2005. 3. Stephen Schach, “ Software Engineering” Seventh edition, McGraw-Hill, 2007. 4. Ivar Jacobson, GrandyBooch, James Rumbaugh, “The Unified Software Development Process”, Pearson Education, 1999. 5. Alistair Cockburn, “Agile Software Development” Second edition, Pearson Education, 2007. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6111 | | **WIRELESS SENSOR NETWORKS** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To have an overview of the physical networking and architectural issues of mobile adhoc networks * To familiarize with sensor networks and the unique set of design challenges that they introduce. * To familiarize with classification of MAC,frameworks,differentQoS and challenges they introduce.  COURSE OUTCOMES:  * Students will be able to understand. * State of wireless and mobile adhoc networking. * Sensor networks and their design and challenges | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Fundamentals of wireless communication technology, the electromagnetic spectrum, radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Issues in designing MAC protocols for adhoc wireless networks, design-goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4. Routing Protocols-Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols. | | | | 10 |
| **IV** | Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Feng Zhao and LeonidesGuibas, "Wireless sensor networks ", Elsevier publication - 2004 2. Jochen Schiller, “Mobile Communications”. Pearson Education, 2nd Edition, 2003. 3. William Stallings, “Wireless Communications and Networks”, Pearson Education-2004 4. William Stallings, “Data and Computer Communications”, Pearson Education. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6113 | | **IMAGE PROCESSING** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * Cover the basic theory and algorithms that are widely used in digital image processing. * Expose students to current technologies and issues that are specific to image processing systems. * Develop hands-on experience in using computers to process images.  COURSE OUTCOMES:  * Understand how images are formed, sampled, quantized and represented digitally. * Understand how image are processed by discrete, linear, time-invariant systems * Understand how images are perceived by humans * Understand how color is represented. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Digitalimagefundamentals**  Imagerepresentation –colorspace–imagesamplingandquantization –relationship between pixels–mathematicaltoolsusedin digitalimageprocessing,Imagetransforms:DiscreteFourier Transform – 2-D FFT – Walsh HadamardTransform – Discrete Cosine Transform – HaarTransform–HotellingTransform–KLTransform. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **IntensityTransformationsandSpatial Filtering**  Basicintensitytransformationfunctions–HistogramProcessing- Spatial Filtering–Smoothing spatial filters – Sharpening spatial filters, Frequency domain filtering: Basics of filtering in frequencydomain-Imagesmoothing–Imagesharpening–Selectivefiltering | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Imagerestoration**  Imagedegradation/restoration model–Noisemodels–Periodicnoisereduction byfrequency domainfiltering–Inverse filtering–Minimummean squareerrorfiltering–Imagereconstruction fromprojections,WaveletTransformsinonedimension–Wavelettransformsintwodimensions | | | | 10 |
| **IV** | **Imagesegmentation**  Regionbasedsegmentation–motioninsegmentation,Imagecompression:compressionmethods–Huffmancoding– arithmeticcoding– LZWcoding– Bitplanecoding,Objectrecognition– structural methods,Colourimageprocessing,IntroductiontoDeterministicand stochasticspatio- temporalimagemodels. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**  1. Rafael C. Gonzalez andRichard E. Wood, “Digital Image Processing”, 3rdEdition, PrenticeHall,2008.  2. AnilKJain,“FundamentalsofDigitalImageProcessing”,PrenticeHall,1989.  3. WilliamK.Pratt,“DigitalImageProcessing”,3rdedition,JohnWiley,2001.  4. RafaelC.Gonzalez, RichardE.WoodsandStevenL.Eddins,“DigitalImageProcessing  UsingMATLAB”,1stEdition,PearsonEducation,2004. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6115 | | **SOFTWARE ARCHITECTURE** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To understand the role of a software architecture in the development of an enterprise   application system.   * To develop the ability to understand the models that are used to document a software   Architecture. COURSE OUTCOMES:  * Be aware of the key elements of software architecture * Be familiar with a variety of architectural styles and how they may be combined in a single system * Have a working knowledge of software architecture design for a non-trivial system * Understand how software architecture aids different stages of the software lifecycle | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Introduction**  Introduction to Software Architecture, Architecture Business Cycle:-, Where do Architectures Come from, Software Processes and the Architecture Business Cycle, Features of Good Architecture. What is software architecture:- Architectural patterns- Reference Models, and Reference Architectures, Importance of software Architecture, Architectural structures and views. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Architectural Styles**  Pipes and Filters-Data Abstraction and Object Oriented Organization-Event based, Implicit Invocation-Layered Systems-Repositories-Interpreters-Process Control-Process control Paradigms-Software Paradigm for Process Control-Distributed processes-Main program / subroutine organizations – Domain – specific software architecture – heterogeneous architectures. Case Study:- Keyword in Context, Mobile Robotics. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Shared Information Systems**  Shared Information Systems Database Integration:- Batch Sequential, Simple Repository, Virtual Repository, Hierarchical layers, Evolution of shared information systems in business data processing, Integration in Software Development Environments, Integration in the design of Buildings, Architectural Structures for Shared Information Systems Database Integration. | | | | 10 |
| **IV** | **Architectural Design Guidance**  Guidance for User-Interface Architectures -Design Space and rules-Design Space for User Inter face Architectures-Design. Rules for User Interface Architecture applying the Design Space – Example – A Validation Experiment – How the Design Space Was Prepared. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**  1. Mary Shaw, David Garlan, “Software Architecture”, Prentice Hall India, 2000.  2. Len Bass, Paul Clements, Rick Kazman, “Software architectures in practice”, Addison-Wesley, 2003.  3. Roger S Pressman, “Software Engineering: A Practitioner’s Approach”, Tata  McGraw Hill, New Delhi, 2001.  4. PankajJalote, “An Integrated Approach to Software Engineering”. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6177 | | **RESEARCH METHODOLOGY** | 0-2-0-2 | 2015 | |
| COURSE OBJECTIVES:   * Make aware of the research process. * Familiarize the tools and skills to investigate a research. * Preparation of an effective report.  COURSE OUTCOMES: On successful completion of the course the students should be able to:   * Do research in a systematic way. * Effective use of appropriate tools for samples and data collection. * Write research proposals and reports. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Introduction-Tools for Planning Research, Finding resources,  internet research skills, Evaluating and citing resources,  publishing research- literature review – problem definition  Reproducible research-focus on the concepts and tools behind reporting modern data analyses in a reproducible manner.  (Students are expected set up a GitHub account and/or take part in collaborative projects such as Mozilla Science Lab,Linux Foundation , Wikis or technical blogging) | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | Sampling fundamentals -Types of sampling: probability and non-probability sampling.Sampling theory, sampling distribution and sample size determination. Tools and techniques of data collection: Questionnaire and schedule for field surveys, interview, observation, simulation, experimental and case study methods. Collection, recording, editing, coding and scaling of data. Scale classification and types. Measurement of validity, reliability and practicality. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Descriptive and inferential statistics - Data analysis and interpretation –testing of hypothesis,testing of population mean, variance and proportion –Z test – t test – F test - chi- square test.– standard error of the estimate. Testing goodness of fit. Brief introduction to non parametric tests, factor analysis, discriminant analysis and path analysis (description only). | | | | 10 |
| **IV** | Meaning of interpretation and inference: importance and care for interpreting results. Presentation of reports: structure and style. Parts of a research report. Guidelines for writing research papers and reports –. Ethics in research. Use of computers and internet in research. Familiarization with Online tools for computer science researchers | | | | 8 |
|  | **Case Study:** Familiarize Latex software for report preparation. Students have to take up a case study on particular samples and conclude with some hypothesis. A report of the same has to be submitted by the student at the end of this course. | | | |  |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**  1. C. R. Kothari, Research Methodology, Methods and techniques (New Age International  Publishers, New Delhi, 2004).  2. R. Panneerseklvam, Research Methodology (Prentice Hall of India, New Delhi, 2011).  3. Ranjit Kumar, Research Methodology, A step by step approach (Pearson Publishers,  New Delhi, 2005.  4. Management Research Methodology : K. N. Krishnaswami, AppaIyer and M  Mathirajan, Pearson Education, Delhi, 2010  5. Hand Book of Research Methodology : M N Borse, SreeNivas Publications, Jaipur,  2004  6. Business Research Methods: William G Zikmund, South – Western Ltd, 2003  7. Research Methods in Social Science: P K Majumdar, Viva Books Pvt Ltd, New Delhi,  2005  8.Analyzing Quantitative Data: Norman Blaikie, SAGE Publications , London, 2003  **WEB REFERENCES:**  Module 1  http://help.library.ubc.ca/evaluating-and-citing-sources/evaluating-information-sources/  http://www.vtstutorials.ac.uk/detective/  http://connectedresearchers.com/online-tools-for-researchers/  https://www.ucl.ac.uk/isd/services/research-it/research-software/infrastructure/github/signup  https://www.mozillascience.org/training  https://www.ucl.ac.uk/isd/services/research-it  http://researchkit.org/  https://www.cs.ubc.ca/our-department/facilities/reading-room/research-publications/research-tools  Module 4  http://www.i-studentglobal.com/study-programmes/science-engineering-computing-technology/50-essential-online-tools-for-every-computer-science-student | | | | | |
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| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
| 05CS6191 | **COMPUTER AIDED SOFTWARE ENGINEERING LAB** | 0-0-2-1 | 2015 |
| 1. System Requirement Specification(SRS)and related analysis documents as per the guidelines in ANSI/IEEE Std 830-1984.   2. Design documents representing the complete design of the software system.  3. AnalysisanddesignforthesameproblemshouldbedoneusingObjectOri-ented approach.  4. Test documents as per ANSI/IEEE Std. 829/1983 Software Test Documenta-tion.  5. Simple exercises in effort and costestimation in COCOMO model.  6. ApplicationofCOCOMOandFunctionPoint(FP)modelfortheactualpro-jectthat has been chosen.  7. Familiarizationof UML diagrams.  8. Familiarization ofCASE workbenches.  9. Familiarization of some reverse engineeringtoolsavailable inthe public do-main.  10. At the end of the semester, there should be a presentation of the project with demonstration.  11. Itisalsoadvisabletohavethestudentspresentthedocumentsassociatedwiththe projectsasandwhentheyareready.Thiswillhelptheinstructoridentify pointingout the mistakes to themand the rest of the students | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6102 | | **MODERN DATABASES** | 3-1-0-4 | 2015 | |
| COURSE OBJECTIVES:   * Be able to design high-quality relational databases and database applications. * Have developed skills in advanced visual & conceptual modelling and database design. * Have developed an appreciation of emerging database trends as they apply to semi-structured data, the internet, and object-oriented databases.  COURSE OUTCOMES:  * Evaluate and Apply Advanced Database Development Techniques. * Evaluate Database Systems. * Administer Database Systems. * Design & Implement Advanced Database Systems. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Parallel and Distributed Databases**  Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Three Tier Client Server Architecture- Case Studies**.** | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Object and Object relational databases**  Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL / Oracle – Case Studies. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Enhanced Data models**  Active Database Concepts and Triggers – Temporal Databases – Spatial Databases – Multimedia Databases – Deductive Databases – XML Databases: XML Data Model – DTD - XML Schema - XML Querying - Geographic Information Systems - Genome Data Management**.** | | | | 10 |
| **IV** | **Emerging Technologies**  Big data, Parallel processing and query optimization, Hadoop, MAP REDUCE XML, Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support – Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula,  OpenStack, Aneka, CloudSim | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007. 2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007. 3. Vijay Kumar,” Mobile Database Systems”, A John Wiley & Sons, Inc., Publication. 4. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006. 5. C.J. Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006. 6. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill, Third Edition 2004. 7. [IBM Zikopoulos, Paul](http://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22IBM+Zikopoulos,+Paul%22), [Chris Eaton](http://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Chris+Eaton%22), “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data” McGraw Hill Professional | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6104 | | **ADVANCED COMPUTER NETWORKS** | 2-1-0-3 | 2015 | |
| **Course Objectives:**   * + To become familiar with the basics of Computer Networks   + To understand various Network architectures   + Concepts of fundamental protocols   + To understand the network traffic, congestion, controlling and resource allocation   **Course Outcomes:**  The students should be able to:   * List and classify network services, protocols and architectures, explain why they are layered. * Choose key Internet applications and their protocols, and apply to develop their own applications   (e.g. Client Server applications, Web Services) using the sockets API.   * Develop effective communication mechanisms using techniques like connection establishment,   queuing theory, recovery Etc.   * Explain various congestion control techniques. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Physical Layer and Data link layer**  Physical Layer: Transmission Media- Wired Transmission, Wireless Transmission, Wireless Propagation, Signal Encoding Techniques.  Data link layer: TCP/IP Protocol Architecture, Framing, Reliable Transmission, Ethernet (802.3) and Token Ring (802.5). | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Network Layer**  Connecting Devices. ARP, RARP. IP Address – Sub netting / Super netting, Packet Forwarding with Classfull / Classless Addressing, Datagram Fragmentation, Components in IP software, Private IP and NAT. ICMP. Routing Protocols -Distance Vector Routing-RIP, Link-State Routing-OSPF | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Transport Layer and ATM Networks**  UDP- Port Addressing, UDP datagram, UDP operation. TCP- TCP services and features, TCP segment, TCP connection, TCP state transitions, TCP module’s algorithm, Flow and Error control, Congestion control. SCTP- SCTP services and features, Packet format, SCTP connection, State Transitions, Flow and Error control. ATM NETWORKS - ATM Layer Structure, ATM Cell, Routing:-VPI, VCI, AAL | | | | 10 |
| **IV** | **Application Layer**  DNS- Distribution of Name Space, Name Resolution, DNS messages, HTTP- Architecture, HTTP Transaction, DHCP - Address allocation, Packet format. SNMP- SMI, MIB, SNMP PDUs, Real Time Data Transfer- RTP, RTCP, Voice over IP-Session Initiation Protocol. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**  1. William Stallings, “Data and Computer Communications”, Pearson Education.  2. Behrouz A Forouzan, “TCP/IP Protocol Suite”, Tata McGraw-Hill.  3. Peterson and Davie, “Computer Networks -A systems approach”, Elsevier.  4. Kurose and Ross, “Computer Networks A systems approach”, Pearson Education.  5. Behurouz A Forouzan, “Data Communications & Networking”, 4th edition, McGraw-Hill. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6106 | | **OPERATING SYSTEMS DESIGN CONCEPT** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * Familiarize various protocols assuming the availability of facilities for data transmission.  COURSE OUTCOMES:  * This course provides an introduction to the fundamentals of distributed computer systems, * Develop, test and debug RPC based client-server programs, also design and build application programs on distributed systems. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Distributedcomputingsystems**  **fundamentals**  Introduction toDistributed computing systems, Models, Popularity. Distributed Computingsystem.DesignissuesofDistributedoperatingsystem.Distributedcomputingenvironment. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **MessagePassing**  FeaturesofagoodMessagePassingSystem.IssuesinIPCby MessagePassingSynchronization, Buffering,Multi-datagramMessages,EncodingandDecodingMessage data,Process Addressing, Failure Handling, Group Communication.RPCModel, Transparency ofRPC, RPC messages, MarshalingArgumentsandResults.ServerManagement,ParameterPassing semantics,call semantics, Communication Protocols for RPCs, Client Server Building, Exception handling, Security,RPCinHeterogeneousEnvironments,LightweightRPC. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **DistributedSharedMemory**  Generalarchitecture ofDSMsystems. Designandimplementation IssuesofDSM,Granularity, Structureof SharedMemorySpace.Consistencymodels,Replacementstrategy,Thrashing. Synchronization: ClockSynchronization. EventOrdering, MutualExclusion, Deadlock, Election Algorithms | | | | 10 |
| **IV** | **ResourceManagement**  Featuresofglobalschedulingalgorithm.Taskassignment approach,Load-BalancingandLoad approach. Process Management: Introduction, Process Migration, Threads. Distributed FileSystems:FeaturesofgoodDFS,Filemodels,FileAccessingmodels. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. PradeepSinhaK., “Distributed Operating Systems Concepts and Design”, PHI LearningPrivateLtd. 2. MukeshSinghal,NiranjanGShivarathri, “Advanced ConceptsinOperatingSystems”,TataMc-GrawHillLtd. 3. Coulouris.G, DollimoreJ &KindbergT, “Distributed Systems concepts and design”, 4thedition,PearsonEducation. 4. TanenbaumAS,“ ModernOperatingSystem”,PHIlearningprivatelimited,3rdedition | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6122 | | **PRINCIPLES OF REAL TIME SYSTEMS** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * + To analyze and design real time systems and conduct research in the area of real time systems.   + To understand basis and importance of real time systems.   + Concepts of fundamental protocols.   + To understand the basic multi-task scheduling algorithms for periodic,aperiodic,sporadic task as well as understand their impact of latter two on scheduling.  COURSE OUTCOMES: The students should be able to:   * + Explain and apply the fundamental concept and terminology of real time system.   + Explain and address the fundamental problems of real time systems.   + Identify fundamental problems, concepts and approaches in the design and the analysis of real time systems. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Introduction: Hard Versus Soft Real time Systems: Jobs and Processors –Real times, Deadlines and Timing constraints – Hard and Soft timing constraints – Hard Real time systems – Soft Real time systems – A reference model of Real time systems: Processors and resources – Temporal parameters of Real time workload – Periodic task model –Precedence constraints and data dependency – Other types of dependencies – Functional Parameters – Resource Parameters of Jobs and Parameters of resources – Scheduling hierarchy. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | Commonly used approaches to Real time scheduling: Clock driven approach – Weighted round robin approach – Priority Driven approach – Dynamic versus Static systems –Effective Release times and Deadlines – Optimality of EDF and LST – Challenges in validating timing constraints in Priority driven systems – Offline versus Online scheduling –Clock driven scheduling: Notations and assumptions – Static Timer driven scheduler –General structure of Cyclic schedules – Cyclic executives – Improving average response time of Aperiodic jobs – Scheduling Sporadic jobs . | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Priority driven scheduling of Periodic jobs: Static assumptions – Fixed priority versus Dynamic priority algorithms – Maximum schedulable utilization – Optimality of RM and DM algorithms – Schedulability test for Fixed priority tasks with Short response times – Schedulability Test for Fixed priority tasks with arbitrary response times – Sufficient Schedulability conditions for RM and DM algorithms. | | | | 10 |
| **IV** | Scheduling Aperiodic and Sporadic Jobs in Priority Driven Systems: Assumptions and Approaches – Deferrable servers – Sporadic servers – Constant Utilization,. Resources and Resource Access Control: Assumptions on resources and their usage – Effects of resource contention and resource access control – Non preemptive Critical Sections – Basic Priority Inheritance Protocol – Basic Priority Ceiling Protocol - Stack Based Priority ceiling Protocol – Preemption Ceiling Protocol. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Jane W.S. Liu, “Real-Time Systems”, Pearson Education, 2000, ISBN NO: 81–7758– 575-4. 2. Phillip A. Laplante, “Real-Time Systems Design and Analysis”*,* Prentice Hall of India, Second Edition, 2001, ISBN NO: 81-203-1684-3. 3. Krishna C. M., Kang G. Shin, “Real-Time Systems”, McGraw-Hill International Edition. ISBN: 0-07-114243-6. 4. Hermann Kopetz “Real-Time Systems: Design Principles for Distributed Embedded Applications”. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6124 | | **SOFTWARE PROJECT MANAGEMENT** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To explain the main tasks undertaken by project managers. * To introduce software project management and to describe its distinctive characteristics * To discuss project planning and the planning process. * To show how graphical schedule representations are used by project management process.  COURSE OUTCOMES:  * Demonstrate the ability to plan and execute project management activities across a broad range of industry sectors and organizations and to employ the appropriate project management tools and techniques across a wide spectrum of project types and requirements. * The students will be able to determine the needs and balance the interests of project stakeholders in any organizational context. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Introduction**  Projects and Project Characteristics, Project Constraints, Software Projects vs. Other Projects, Problems with Software Projects, Software Project Failures & Major Reasons, What is Project Management?, Need for Software Project Management, Project Management Framework – Project Stakeholders, PM Competencies, Project Environment, Project Organization Types, Project Management Life Cycle, Business Case, Cost Benefit Analysis, Project Charter. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Project Planning**  Basic Objectives, Key Planning Tasks, Scope Definition, Work Breakdown Structure (WBS), Activity Planning, Activity Sequencing, Activity Duration Estimation, Network Models – PDM, CPM, Identifying Critical Path, Resource Assignment, Gantt Chart, Project Plan Development, Other Plans – SQA Plan, Test Plan, Risk Management Plan, Configuration Management Plan, Resource Plan, Communication Plan, Contents of a Typical Software Project Plan, Project Monitoring and Control, Project Tracking using Earned Value Analysis, Tracking Gantt, Project Scheduling and Tracking using MS Project. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Software Metrics & Quality Assurance**  Software Metrics: Product and Process Metrics – Size, Effort, Duration, Productivity, Defect Density, Reliability; Software Estimation Techniques – Function Point Analysis, Effort and Schedule Estimation using COCOMO, WBS based Estimation.  Software Quality Assurance: Concepts of Quality Assurance, Quality Control, Cost of Quality, Verification and Validation; Quality Planning; Quality Control Tools. | | | | 10 |
| **IV** | **Other Topics**  Project Risk Management – Risk Identification, Top 10 Software Project Risks, Risk Analysis and Prioritization, Risk Response Planning, Risk Resolution, Risk Tracking and Control, Software Configuration Management – Software Configuration Items (SCI), Change Control, Version Control, Agile Project Management using Scrum. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**  1. Bob Huges& Mike Cotterell, “Software Project Management”, Tata McGraw Hill, New Delhi, 2002.  2. PankajJalote, “Software Project Management in Practice”, Pearson Education Ltd, 2005.  3. Gopalaswamy Ramesh, “Managing Global Software Projects”, Tata McGraw Hill, New Delhi, 2006.  4. Roger S Pressman, “Software Engineering: A Practitioner’s Approach”, Tata McGraw Hill, New Delhi, 2001.  5. PankajJalote, “An Integrated Approach to Software Engineering”. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6126 | | **GRID COMPUTING** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:  • To provide an overview of the basic concepts of Grid Computing;  • To highlight the advantages of deploying Grid Computing; and  • To illustrate the practical adoption of a Grid deployment through real life case studies.  COURSE OUTCOMES:  Upon completion of this course, attendees should be able to:   * Understand and explain the basic concepts of Grid Computing; * Explain the advantages of using Grid Computing within a given environment. * Prepare for any up coming Grid deployments and be able to get started with a potentially available Grid setup. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Grid Computing**  Introduction -Definition -Scope of grid computing. Grid computing model- Grid Protocols – Desktop grids: Characteristics – key elements – Role in enterprise computing infrastructure. Data grids: Avaki Data Grid – Data grid Architecture. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Grid Computing Initiatives**  Grid Computing Organizations and their roles – Grid Computing anatomy – Grid Computing road map. Grid Computing Applications: Merging the Grid services Architecture with the Web Services Architecture. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Technologies**  OGSA – Sample use cases – OGSA platform components – OGSI – OGSA Basic Services.  Managing Grid Environments: Managing grids – management reporting – monitoring – service level management – data catalogs and replica management. | | | | 10 |
| **IV** | **Grid Computing Tool Kits**  Globus GT3 Toolkit – Architecture, Programming model, High level services – OGSI .Net middleware Solutions. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Joshy Joseph & Craig Fellenstein, “Grid Computing”, PHI, PTR-2003. 2. Ahmar Abbas, “Grid Computing: A Practical Guide to technology and Applications”, Charles River media – 2003. 3. Ian Foster, Carl Kesselman, “The Grid2: Blueprint for a New Computing Infrastructure”. Morgan Kaufman, New Delhi, 2004. 4. Fran Bermn, Geoffrey Fox, Anthony Hey J.G., “Grid Computing: Making the Global Infrastructure a Reality”, Wiley, USA, 2003. 5. Maozhen Li, Mark Baker, “The Grid: Core Technologies”, John Wiley & Sons, 2005. 6. URLs: www.globus.org and glite.web.cern.ch (Unit 5). | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6132 | | **SOFTWARE TESTING** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To determine software testing objectives and criteria * To discuss various software testing issues and solutions * To prepare testing policies and standards * To learn how to planning a test project * To gain the techniques and skills on how to use modern software testing tools to support software testing projects.   COURSE OUTCOMES:   * Ability to analyze a problem and identify and define the computing requirements appropriate to its solution. * Ability to function effectively on teams to accomplish common goal. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Fundamentals of Testing and Role of Testing in SDLC Human and errors, Testing and Debugging, Software Quality, Requirement Behavior and Correctness, Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics. Review of software development models (Waterfall Models, Spiral Model, W Model, V Model) Agile Methodology and Its Impact on testing, Test Levels (Unit, Component, Module, Integration, System, Acceptance, Generic) | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Approaches to Testing**  Static Testing Structured Group Examinations Static Analysis Control flow & Data flow, Determining Metrics Dynamic Testing Black Box Testing Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing and Advanced black box techniques White Box Testing Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage, Advanced White Box Techniques, Instrumentation and Tool Support Gray Box Testing, Intuitive and Experience Based Testing. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Test Management**  Test Organization Test teams, tasks and Qualifications Test Planning Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria Cost and economy Aspects Test Strategies Preventive versus Reactive Approach, Analytical versus heuristic Approach Test Activity Management, Incident Management, Configuration Management Test Progress Monitoring and Control Specialized Testing: Performance, Load, Stress& Security Testing. | | | | 10 |
| **IV** | **Testing tools**  Automation of Test Execution, Requirement tracker, High Level Review Types of test Tools, Tools for test management and Control, Test Specification, Static Testing, Dynamic Testing, Non functional testing Selection and Introduction of Test Tools Tool Selection and Introduction, Cost Effectiveness of Tool Introduction. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Software Testing Foundations, Andreas Spillner, Tilo Linz, Hans Schaefer, Shoff Publishers and Distributors 2. Software Testing: Principles and Practices by Srinivasan D and Gopalswamy R, PearsonEd, 2006. 3. Foundations of Software Testing by Aditya P. Mathur – Pearson Education custom edition 2000. 4. Testing Object Oriented Systems: models, patterns and tools, Robert V Binder, Addison Wesley, 1996. 5. Software Engineering – A practitioner’s approach by Roger S. Pressman, 5th Edition, McGraw Hill. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6134 | | **PRINCIPLES OF NETWORK SECURITY** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To understand the basics of cryptographic attacks and web application security. * To acquire knowledge in various types ciphers, cryptographic algorithm and SQL injection. * To describe and analyze existing authentication protocols and platform level defense mechanism.   COURSE OUTCOMES:   * They will be able to develop code to implement cryptographic algorithm or write an analysis report on any existing security products. * They will be able to understand firewall based solution against security threats. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Web application security- Key Problem factors – Core defence mechanisms- Handling user access- handling user input- Handling attackers – web spidering – Discovering hidden content  Transmitting data via the client – Hidden form fields – HTTP cookies – URL parameters – Handling client-side data securely – Attacking authentication – design flaws in authentication mechanisms –securing authentication  Attacking access controls – Common vulnerabilities – Securing access controls. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | Symmetric Key cryptography: Block cipher design principles and criteria, DES, IDEA, AES, RCS, Blowfish, Differential and linear cryptanalysis. Asymmetric key cryptography: Principles of public key crypto systems, RSA algorithm, key management, Diffie-Hellman key exchange  SQL Injection - How it happens - Dynamic string building - Insecure Database Configuration - finding SQL injection – Exploiting SQL injection – Common techniques – identifying the database – UNION statements – Preventing SQL injection- Database Hacking – Database discovery – Database vulnerabilities. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Platform level defenses - Using run time protection - web application Firewalls - Using ModSecurity - Intercepting filters- Web server filters - application filters – securing the database – Locking down the application data – Locking down the Database server. | | | | 10 |
| **IV** | System Security- Intrusion Detection, Password Management, Viruses and related threats, Virus counter measures, Firewalls-Design Principles, Trusted Systems, Web Security:- Web Security consideration, Secure Socket Layer, Transport Layer Security, Secure Electronic Transaction. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. William Stallings, “Cryptography and network security- principles and practice”, 3 rd Edition, Pearson Prentice Hall. 2. DafyddStuttard, Marcus Pinto, The Web Application Hacker’s Handbook, 2nd Edition, Wiley Publishing, Inc. 3. Justin Clarke, SQL Injection Attacks and Defense, 2009, Syngress Publication Inc. 4. Magnus Mischel , ModSecurity 2.5,  Packt Publishing 5. AtulKahate, “Cryptography and network security“, TMGH | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS6136 | | **INFORMATION THEORY AND CODING** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To equip students with the basic understanding of the fundamental concept of entropy and information as they are used in communications. * To understand the design and analysis of coding/decoding scheme for digital communication application * To guide the student through the implications and consequences of fundamental theories and laws of information theory and coding theory with reference to the application in modern   communication and computer systems   COURSE OUTCOMES:   * Calculate the information content of a random variable from its probability distribution. * Relate the joint, conditional, and marginal entropies of variables in terms of their coupled probabilities. * Define channel capacities and properties using Shannon's Theorems. * Construct efficient codes for data on imperfect communication channels. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Introduction**  Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source codingtheorem, Shannon-Fanocoding, Huffman coding, Extended Huffmancoding - Joint and conditional entropies, Mutualinformation -Discrete memory-less channels –BSC, BEC–Channelcapacity,Shannonlimit. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **DefinitionsandPrinciples**  Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hammingcodes,Repetitioncodes-Linearblockcodes – Encoding and Decoding of Systematic and Unsystematic Codes, Standard Array and Sydrome Decoding. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Cycliccodes**  Cycliccodes-Generator Polynomial – Generator and parity Check matrices, Encoding andSyndromecalculation,Encoderanddecoder-CRC,Convolutionalcodes–code tree,trellis,statediagram. | | | | 10 |
| **IV** | **EncodingandDecoding**  Decoding of Convolutional Codes – Maximum Likelihood Decoding - SequentialsearchandViterbialgorithm, Stack Algorithm–PrincipleofTurbocoding-AdaptiveHuffmanCoding, ArithmeticCoding, ZIP coding. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**  1. KSayood,“IntroductiontoDataCompression”,Elsevier2006.  2. SGravano,“IntroductiontoErrorControlCodes”,OxfordUniversityPress2007.  3. AmitabhaBhattacharya,“DigitalCommunication”,TMH2006.  4. RBose,“InformationTheory,CodingandCryptography”,TMH2007.  5. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols andStandards”,PearsonEducationAsia,2002. | | | | | |
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| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
| 05CS6166 | **SEMINAR-I** | 0-0-2-2 | 2015 |
| Each student should present a seminar on any topic related to the core/elective courses offered in the first semester of the M. Tech. Program. The selected topic should be based on the papers published in reputed international journals preferably IEEE/ACM. The selected paper should be approved by the Program Co-ordinator/Faculty member before presentation. The students should undertake a detailed study on the topic and submit a report at the end of the semester. Marks will be awarded based on the topic, presentation, participation in the seminar and the report. | | | |
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| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
| 05CS6188 | **MINI PROJECT** | 0-0-4-2 | 2015 |
| The mini project is designed to develop practical ability and knowledge in tools/techniques to solve problems related to the industry, academic institutions and computer science research. Students can take up any application level/system level project pertaining to a relevant domain, preferably based on papers from IEEE/ACMjournals. Projects can be chosen either from the list provided by the faculty or in the field of interest of the student. The topic should be approved by the Programme Co-ordinator / Faculty member before carrying out the work. For external projects, students should obtain prior permission after submitting the details of the guide and synopsis of the work. The project guide should have a minimum qualification of ME/M.Tech in Computer Science or related fields. At the end of each phase, presentation and demonstration of the project should be conducted, which will be evaluated by a panel of examiners. A detailed project report duly approved by the guide in the prescribed format should be submitted for end semester assessment. Marks will be awarded based on the report and their performance during presentations and demonstrations. Publishing the work in Conference Proceedings/Journals with National/International status with the consent of the guide will carry an additional weightage in the evaluation process. | | | |
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| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
| 05CS6192 | **NETWORK SYSTEMS LAB** | 0-0-2-1 | 2015 |
| List of Experiments:  1. A thorough study of packet capturing tool called WireShark.  2. Familiarizing Network Simulator – 2 (NS2) with suitable examples  3. Simulate a wired network consisting of TCP and UDP Traffic using NS2 and then calculate their respective throughputusingAWKscript.  4. Performanceevaluationofdifferentroutingprotocolsinwirednetworkenvironmentusing  NS2  5. Performanceevaluationofdifferentqueuesandeffectofqueuesandbuffersinwired network environment using NS2  6. ComparethebehaviorofdifferentvariantsofTCP(Tahoe,Reno,Vegas….)inwired network using NS2. Comparison can be done on the congestion window behavior by plotting graph.  7. Simulation of wireless Ad hoc networks using NS2  8. SimulateawirelessnetworkconsistingofTCPandUDPTrafficusingNS2andthen calculate their respective throughputusingAWKscript.  9. Performance evaluation of different ad-hoc wireless routing protocols (DSDV, DSR, AODV …) using NS2  10.Create different Wired-cum-Wireless networks and MobileIP Simulations using NS2 | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS7141 | | **DATA WAREHOUSING AND DATA MINING** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * This course helps the students to understand the overall architecture of a data warehouse and techniques and methods for data gathering and data pre-processing using OLAP tools. The different data mining models and techniques will be discussed in this course. Data mining and data warehousing applications in bioinformatics will also be explored.   COURSE OUTCOMES:   * Students would learn data mining techniques and methods in integrating and interpreting the bioinformatics data sets and improving effectiveness, efficiency and quality for bioinformatics data analysis. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **DataWarehousingandBusinessAnalysis**  DatawarehousingComponents–Buildinga Datawarehouse–MappingtheDataWarehousetoa MultiprocessorArchitecture–DBMSSchemasforDecisionSupport–DataExtraction,Cleanup, and Transformation Tools – Metadata – Reporting, Query tools and Applications – Online AnalyticalProcessing(OLAP) | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Data Mining**  Introduction- DataPreprocessing–DataCleaning–DataIntegrationandTransformation–Data Reduction–DataDiscretizationandConceptHierarchyGeneration.AssociationRule Mining:- EfficientandScalableFrequentItemsetMiningMethods–MiningVariousKindsof Association Rules–AssociationMiningtoCorrelationAnalysis–Constraint-BasedAssociationMining. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **ClassificationandPrediction**  IssuesRegardingClassification andPrediction–Classification byDecisionTreeIntroduction– Bayesian Classification – Rule Based Classification – Classification by Back propagation – SupportVectorMachines–Associative Classification –LazyLearners –OtherClassification Methods–Prediction–AccuracyandErrorMeasures–EvaluatingtheAccuracyofaClassifier orPredictor–EnsembleMethods–ModelSection | | | | 10 |
| **IV** | **ClusterAnalysisandApplicationsandTrendsinDataMining**  TypesofDatainClusterAnalysis–ACategorizationofMajorClusteringMethods–Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods –Model- Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis-DataMiningApplications–TrendsinDataMining | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. AlexBersonandStephenJ.Smith“DataWarehousing,DataMining&OLAP”,TataMcGraw –HillEdition,TenthReprint2007. 2. K.P.Soman,ShyamDiwakarandV.Ajay“InsightintoDataminingTheory andPractice”, EasterEconomyEdition,PrenticeHallofIndia,2006. 3. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, PrenticeHallofIndia,2006. 4. Pang-NingTan,MichaelSteinbachandVipinKumar“IntroductiontoDataMining”,Pearson Education,2007. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS7143 | | **CLOUD COMPUTING** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To understand the emerging area of "cloud computing" and how it relates to traditional -models of computing. * To gain competence in Map Reduce as a programming model for distributed processing of large datasets. Specifically. * To understand and be able to articulate key concepts behind MapReduce, including its functional abstraction, the use of distributed storage, and the scheduling of data-local jobs. * To understand how well-known algorithms such as PageRank and inverted index construction can be expressed in the MapReduce framework. * To gain competence in Ajax as a vehicle for delivering highly-interactive Web applications.   COURSE OUTCOMES:   * Understanding the key dimensions of the challenge of Cloud Computing * Assessment of the economics , financial, and technological  implications for selecting cloud computing for own organization * Assessing the financial, technological, and organizational capacity of employer’s for actively initiating and installing cloud-based applications. * Assessment of own organizations’ needs for capacity building and training in cloud computing-related IT areas. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Understanding cloud computing**  Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – AdvantagesofCloudComputing–DisadvantagesofCloudComputing– CloudServices understandingcloudservices:Web-Based Application – Pros and Cons of Cloud Service Development–TypesofCloudServiceDevelopment–SoftwareasaService–Platform asa Service –Infrastructure as a service– On-Demand Computing , Case studies – Amazon Ec2 – Google App Engine –Microsoft Azure- IBM Clouds. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Webservices, AJAX,Mashups and virtualization**  Webservices:SOAPandREST,SOAPversus REST,AJAX:asynchronous'rich' interfaces, Mashups: user interfaceservices ,Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization, Implementation levels of virtualization,Multitenantsoftware: Multi-entity support, Multi-schema approach, Multitenance using cloud data stores, Data access control for enterprise applications. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Cloud Security**  Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture: Architectural Considerations- General Issues, TrustedCloudcomputing,SecureExecution EnvironmentsandCommunications,Micro- architectures;IdentityManagementandAccesscontrol:Identitymanagement-Accesscontrol, Autonomic Security,Cloud computing security challenges: Virtualization security management-virtualthreats,VMSecurity Recommendations,VM-SpecificSecurity techniques. | | | | 10 |
| **IV** | **Communication and migration**  Communicating with the cloud,media and streaming,Cloud management standards, Monitoringthecloud.Migratingto thecloud:cloud services for individuals,enterpriseclass cloud offerngs,migration:,Broad Approaches toMigratingintotheCloud-theSeven-Step Model of Migration into a Cloud,mobile clouds and mobile webservices,bestpractices,enterprise cloud computing ecosystem | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Michael Miller, Cloud Computing: Web-Based Applications That Change the WayYou Work and Collaborate Online, Que Publishing, August 2008. 2. Sosinsky B., “Cloud Computing Bible”, Wiley India 3. GautamShroff “Enterprise Cloud Computing”,Cambridge university press 4. Kai Hwang,Geoffrey C. Fox,Jack J. Dogarra,”Distributed and cloud computing:From parallel processing to the Internet of Things”,Morgan Kaufman, 2012. 5. Ronald Krutz and Russell Dean Vines,” Cloud Security-a comprehensive guide to secure cloud Computing, Wiley-India 6. TimMalhar, S.Kumaraswammy, S.Latif,”Cloud Security & Privacy “,(SPD,O’REILLY) 7. Antohy T Velte, et.al ,”Cloud Computing :A Practical Approach,” McGraw Hill. 8. BuyyaR.,BrobergJ.,GoscinskiA.,“CloudComputing:PrinciplesandParadigm”. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS7145 | | **AGENT BASED INTELLIGENT SYSTEMS** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To provide introduction to the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence. * To familiarize with Fuzzy Logic and knowledge processing in expert systems.   COURSE OUTCOMES:   * Students will gain an appreciation of basic agent-based systems and architectures, and an understanding of how they are used to construct small and large-scale applications. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Introduction**  Definitions - Foundations - History - Intelligent Agents-Problem Solving-Searching – UninformedSearchstrategies-BFS,DFS-Heuristics–Greedy best-first,A\*-Localsearch- ConstraintSatisfactionProblems– BacktrackingsearchforCSPs,LocalsearchforCSP- AdversarialSearch-Gameplaying,Minmaxalgorithm,Alpha-Betapruning. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Knowledge Representation and Reasoning**  LogicalAgents–Reasoningpatterninpropositionallogic,Agentbasedonpropositionallogic- First orderlogic- First OrderInference-Unification-forwardChaining-Backwardchaining- ResolutionStrategies-KnowledgeRepresentation-Objects-Actions-Events. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Planning Agents**  Planning Problem-State Space Search-Partial Order Planning- planning Graphs-planning and Actingin NondeterministicDomains-ConditionalPlanning-ContinuousPlanning-MultiAgentPlanning. | | | | 10 |
| **IV** | **Agents and Uncertainty**  Actingunderuncertainty–ProbabilityNotation-Bayes Ruleanduse–Semanticsof Bayesian Networks- Inference inBayesian networks-Other Approaches-Time andUncertainty-Temporal Models-UtilityTheory-DecisionNetwork. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”, 2ndEdition,PrenticeHall,2002. 2. MichaelWooldridge,“AnIntroductiontoMultiAgentSystem”,JohnWiley,2002. 3. PatrickHenryWinston,”ArtificialIntelligence”,IIIEdition,AW,1999. 4. NilsJ.Nilsson,”PrinciplesofArtificialIntelligence”,NarosaPublishingHouse. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS7151 | | **ADVANCED INFORMATION SECURITY CONCEPTS** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To develop an understanding of information assurance as practiced in computer operating systems, distributed systems,networks and representative applications. * To develop an understanding of security policies as well as protocols to implement such policies in the form of message exchanges.   COURSE OUTCOMES:   * The students will be able to do security policies, authentication before access, integrity of information and confidentiality of information. * The students can use the concepts of cryptography, tools and techniques for enforcement of security policies . | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Secure Coding: Buffer Overrun, Format String Problems, Integer Overflow, and Software Security Fundamentals, SQL Injection, Command Injection, Cross Site Scripting, Magic URLs, Weak Passwords, information Leakage, Race Conditions. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | Ethical Hacking: Hacking Fundamentals, Reconnaissance, Scanning and Enumeration, Sniffers, ARP poisoning and MAC Flooding, Denial of Service, Session Hijacking, Social Engineering Web server-working, vulnerability and attack, Web Application Penetration Testing, Structure of  Penetration Testing, reverse engineering (using debuggers such ollydbg or immunity debugger), Digital Forensics (different approaches basic idea) | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Web application and Cloud Security: Web Application Technologies-HTTP protocol, Attacking Session Management- Weaknesses in Session Token Generation, Weaknesses in Session Token Handling, Securing Session Management, Attacking Access Controls-vulnerabilities, attacks and countermeasures, Attacking Application Logic- Fooling a Password Change Function, Abusing a Search Function, Cloud architecture model – Cloud delivery model, SPI framework, SaaS, PaaS, Iaas, Deployment models –Public, community, Private, Hybrid Cloud, Cloud security design principles, Secure cloud software requirements, Secure development practice, Virtualization security Management- virtual threats, VM security recommendations, VM security techniques – hardening, securing VM remote access. | | | | 10 |
| **IV** | Biometric Security: The Need for Strong Authentication. The role of Strong Authentication with Single Sign-On (SSO), Biometric Technologies: Finger-representation of finger image, types of algorithms for interpretation , Face- representation of face image, types of algorithms for interpretation , Voice- voice capturing , types of algorithms for interpretation, Iris- capturing iris image, types of algorithms for interpretation, general spoofing techniques. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Howard, LeBlanc, and Viega, “24 Deadly Sins of Software Security", ISBN: 978-0-07- 162675-0. 2. CEH: Certified Ethical Hacker Study Guide, Kimberly Graves, SERIOUS SKILLS. 3. D. Stuttard and M. Pinto, "The Web Application Hacker's Handbook", Wiley, 2008 4. Biometrics and Network Security, Paul Reid, Prentice Hal, ISBN 9788131716007 | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS7153 | | **MULTI CORE ARCHITECTURE** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To expose students to the problem related to multiprocessing * To understand the types of multicore architecture and also understand the concept of multithreading.   COURSE OUTCOMES:   * Identify the limitations of ILP and need for multocore architecture. * Solve the issues related to multiprocessing and suggested solutions. * Point out the salient features of multicore architecture and show how they exploit parallelism. | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | Fundamentals of Superscalar Processor Design- Limitations of ILP, Super Scalar Processor Design, Multi Threading, Thread Level Parallelism – Introduction to Multicore Architecture – Multicore VsMultiThreading. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | Symmetric shared memory architectures, distributed shared memory architectures, Issues related to multicore caches, Design of mutlicore core caches, levels of caches, cache optimization, Models of memory consistency, Virtual Memory. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | Cache coherence protocols (MSI, MESI, MOESI),scalable cache coherence, Snoop-based Multiprocessor Design -- Correctness requirements, design with single-level caches and an atomic bus, multilevel cache hierarchies, dealing with split-transaction bus, coherence for shared caches and virtually indexed caches, TLB coherence Overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization. | | | | 10 |
| **IV** | PowerPC architecture – RISC design, PowerPC ISA, PowerPC Memory Management Power 5 Multicore architecture design, Power 6 Architecture. Cell Broad band engine architecture, PPE (Power Processor Element), SPE (Synergistic processing element) Interconnection Network Design - Interconnection topologies, routing techniques, flow control mechanisms, router architecture, arbitration logic. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. Hennessey & Paterson, “Computer Architecture A Quantitative Approach”, Harcourt Asia, Morgan Kaufmann, 1999. 2. Kai Hwang, “Advanced Computer Architecture: Parallelism, Scalability and Programmability” McGraw-Hill,1993. 3. Richard Y. Kain, “Advanced Computer Architecture: A System Design Approach”, PHI, 1999. 4. Multicore Technology: Architecture, Reconfiguration, and ModelingMuhammadYasirQadri, Stephen J. Sangwine. | | | | | |
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| COURSE CODE | | COURSE NAME | L-T-P-C | YEAR | |
| 05CS7155 | | **DESIGN AND ANALYSIS OF ALGORITHMS** | 2-1-0-3 | 2015 | |
| COURSE OBJECTIVES:   * To develop an understanding about basic algorithms and different problem solving   strategies.   * To improve creativeness and the confidence to solve non-conventional problems and   expertise for analysing existing solutions.  COURSE OUTCOMES:   * Learn good principles of algorithm design; * Learn how to analyse algorithms and estimate their worst-case and average-case behavior. * Become familiar with fundamental data structures and with the manner in which these data structures can best -be implemented; become accustomed to the description of algorithms in both functional and procedural styles; * Learn how to apply their theoretical knowledge in practice (via the practical component of the course). | | | | | |
| MODULE | COURSE CONTENT (36 hrs) | | | | HRS |
| **I** | **Review of Basic Concepts**: Mathematical induction, Big Oh, Omega and Theta notations. Algorithm design methods: greedy algorithm, divide and conquer, dynamic programming. Solution of recurrence equations: Substitution method, recursion tree method and Master theorem, Amortized analysis: Aggregate analysis, potential method, accounting method. | | | | 9 |
| **INTERNAL TEST 1 (Module 1)** | | | | | |
| **II** | **Advanced Structures:** Binary search trees, B trees, AVL trees, Red black trees, splay trees. Van EmdeBoas trees. Randomly built binary search trees. Heaps, Binomial heaps, Fibonacci heaps.Minimum spanning trees, BFS, DFS, Strongly connected components, Biconnected components. | | | | 9 |
| **INTERNAL TEST 2 (Module 2)** | | | | | |
| **III** | **Approximation algorithms:** NP completeness, Reductions, coping with NP completeness, Approximation algorithms: The vertex cover problem, The travelling salesman problem, The set covering problem, The Subset-sum problem. Graph colouring. | | | | 10 |
| **IV** | **Randomized algorithms:** Las Vegas and Monte Carlo algorithm, Random variables and their expectations. probabilistic analysis and uses of indicator random variables: Birthday paradox, coupon collector’s problem, The online hiring problem. Randomized version of quick sort, Miller Rabin randomized primality Test. | | | | 8 |
| **END SEMESTER EXAM (ALL Modules)** | | | | | |
| **REFERENCES:**   1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford stein, “Introduction to Algorithms*”,* Third edition, Prentice Hall India, 2011. 2. Sara. Basse, Allen Van Gelder, “Computer Algorithms: Introduction to Design and Analysis*”*, Pearson, 2000. 3. R. Motwani and P. Raghavan, *“*Randomized Algorithms*,”* Cambridge University Press, 1995. 4. Dexter C .Kozen, *“*The Design and Analysis of Algorithms*,”*Springer, 1992 5. Mark Allen Weiss, *“*Data Structures and Algorithm Analysis in C++*,”* Third edition, Pearson 2007.Michael Sipser, *“*Introduction to theory of computation*”*, Thomson Course technology, 2006. 6. Alfred V Aho, Jeffrey D Ullman, John E Hopcroft, *“*Data Structures and Algorithms*”*, Pearson, 1983 7. SartajSahni, *“*Data Structures, algorithms & applications In *C++,”* university press, 2008. | | | | | |
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| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
| 05CS7167 | **SEMINAR- II** | 0-0-2-2 | 2015 |
| Each student shall present a seminar on any topic related to their miniproject or thesis work of the M. Tech. Program. The selected topic should be based on the papers published in reputed international journals preferably IEEE/ACM. They should get the paper approved by the Program Co-ordinator/Faculty member in charge of the seminar and shall present it in the class. Every student shall participate in the seminar. The students should undertake a detailed study on the topic and submit a report at the end of the semester. Marks will be awarded based on the topic, presentation, participation in the seminar and the report submitted. | | | |
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| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
| 05CS7187 | **PROJECT PHASE-1** | 0-0-8-6 | 2015 |
| In Master’s thesis Phase-I, the students are expected to select an emerging research area in Computer Science or related fields, after conducting a detailed literature survey. A detailed design should be prepared based on the study, comparison, analysis and review of the research work and recent developments in the area. Recent National/International Conference Proceedings/Journals, preferably IEEE/ACM, should be referred for the selection of the topic.  Students should submit a copy of Phase-I thesis report covering the content discussed above and highlighting the features of work to be carried out in Phase-II of the thesis. Emphasis should be given for literature survey, scope and design of the proposed work along with the details of the preliminary work carried out on the thesis topic.  The candidate should present the current status of the thesis work and the assessment will be made on the basis of the work and the presentation, by a panel of examiners. This panel can be a committee headed by the head of the department with two other faculty members in the area of the project, of which one shall be the project supervisor .If the project is done outside the college, the external supervisor associated with the student will also be a member of the committee. The examiners should give their suggestions in writing to the students so that it should be incorporated in the Phase–II of the thesis. | | | |
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| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
| 05CS7188 | **PROJECT PHASE-1I** | 0-0-21-12 | 2015 |
| In the fourth semester, the thesis work approved and evaluated in third semester should be continued and carried out to successful completion . A detailed thesis report should be submitted at the end of phase II. The work carried out should lead to a publication in a National / International Conference or Journal. The papers received acceptance before the M.Tech evaluation will carry specific weightage.  Final evaluation of the project will be taken up only on completion of the project. This shall be done by a committee constituted by the principal of the college for the purpose. The concerned head of the department shall be the chairman of this committee. It shall have two senior faculty members from the same department, project supervisor and external supervisor of the student, if any and an external expert either from an academic /R&D organization or from industry as members. | | | |
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