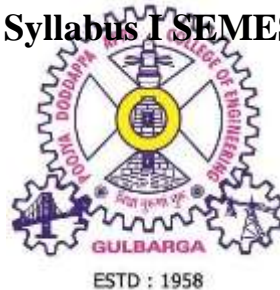


**CURRICULUM  
FOR THE ACADEMIC YEAR 2022-2023**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**M.Tech. (Computer Science &  
Engineering)**

**Syllabus I SEMESTER**



**POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING  
(An autonomous college under  
VTU)  
KALABURAGI**

## **About the Institute**

Poojya Doddappa Appa College of Engineering was the first Institution established by the Hyderabad Karnataka Education Society in 1958 by Sri. Mahadevappa Rampure, with an aim to impart quality education to the youth of Hyderabad Karnataka region. The college is spread over 71 acres of land and has sprawling complex housing student activity center, 1000 seat capacity auditorium and gardens and greenery around.

At present the total intake of the Institute stands at 980 in 11 UG programmes, 193 in 10 PG programmes and 197 Research Scholars pursuing their Ph.D. in 12 Research centres. UGC has approved the academic autonomy from 2009-10 to 2014-15 and extended up to 2018-

19. College has been declared fit under section 2(f) and 12 (B) of UGC Act 1956. The Institute has been awarded with Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education).

The College receives grant in aid funds from State Government for five departments. A number of research projects have been funded by MHRD/AICTE which includes also funds for modernization of laboratories. The institute is one among nine Institutions identified by Ministry of ITBT, Govt. of Karnataka for setting-up Incubation Centre. Innovative ideas of the students are encouraged to be translated into commercial products for the benefit of society. A fund of Rs.3 Lakh per project is being financed by Ministry of ITBT, Govt. of Karnataka. The institute is declared as the best NAIN Centre for submitting ten innovative projects for 2016. Several UG student projects are funded by Karnataka State Council for Science and Technology every year.

The college has got a central library facility which houses also a separate digital library with 40 PCs. The library has got large collection of books along with e-journals which is upgraded every year by allocation of necessary funds. Training & Placement Computer Centre with 120 Core i5 systems with LCD Screen has been setup to provide facility for conducting Training, Workshops, Seminars, Conferences, Online examination etc. Separate hostel facility is provided for boys and girls. An exclusive Examination Centre housing state of the art facilities has been constructed. 100 Mbps internet facility and wi-fi facility are provided for the students. The student activity center houses sports facilities, canteen facility and three seminar halls.

The college has acquired autonomous status for both UG and PG programs since 2007-08 and is one among six colleges in Karnataka State to acquire the autonomous status for both UG and PG programs. The college is one among 14 colleges selected under TEQIP scheme, sponsored by World Bank. The college is selected for TEQIP-III as Mentoring Institution for BIET, Jhansi, UP by NPIU New Delhi. The Institute, taking the advantage of academic autonomy, believes in preparing the students through OBE adopting Choice Based Credit System (CBCS) and Continuous Assessment and Grading Pattern of examination. Also a one year diploma course in Interior design has been

started by the Architecture department. The curriculum is framed with wide interaction with alumni and Industry resource persons so as to impart necessary updated skills in the students.

Highly qualified and dedicated human resource, state of the art facilities, effective institute-alumni and industry-institute interaction make the learning process a unique and satisfying experience at Poojya Doddappa Appa College of Engineering.

## **About the Department**

The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 25 students) and PG (Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. The department is having state-of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

## **Institute Vision**

To be an institute of excellence in technical education and research to serve the needs of the Industry and society at local and global levels.

## **Institute Mission**

1. To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
2. To explore, create, and develop innovations in engineering and science through research and development activities.
3. To provide beneficial service to the national and multinational industries and Communities through educational, technical, and professional activities.

## **Department Vision**

To become a premier department in computer education and research to prepare highly competent IT professionals to serve industry and society at local and global levels.

### **Department Mission**

**M1** - To impart high quality professional education to become a leader in Computer Science and Engineering.

**M2** - To achieve excellence in Research for contributing to the development of the society.

**M3** - To inculcate professional and ethical behavior to serve the industry.

### Program Educational Objectives (PEO)

|              |   |
|--------------|---|
| <b>PEO1:</b> | To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze Computer Science and Engineering problems |
| <b>PEO2:</b> | To adapt to evolving technologies and tools for serving the society   |
| <b>PEO3:</b> | To perform a team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values    |
| <b>PEO4:</b> | To encourage students to pursue higher studies, engage in research and to become entrepreneurs  |

### **PROGRAM OUTCOMES**

#### **Engineering Graduates will be able to:**

- 01. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- 02. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 03. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 04. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 05. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 06. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess

societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

07. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
08. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
09. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability engage in independent and life-long learning in the broadest context of technological change.

### **Program Specific Outcomes (PSOs):**

|      |   |
|------|---|
| PSO1 | Acquire competency in hardware and software working principles to analyze and solve Computing problems.           |
| PSO2 | Design quality software to develop scientific and business applications following Software Engineering practices. |
| PSO3 | Apply cutting edge technologies using modern tools to find novel solutions ethically to Existing problems.        |

**PDA College of Engineering, Kalaburgi**  
**Scheme of Teaching and Examinations–**  
**2022**

**M.Tech., COMPUTER SCIENCE&ENGINEERING**  
**Choice Based Credit System(CBCS)and Outcome-Based Education (OBE)**

**ISEMESTER**

| Sl.No        | Course      | Course Code | Course Title                        | Teaching Hours per Week  |                       |  | Examination          |              |              |                | Credits |
|--------------|-------------|-------------|-------------------------------------|--|-----------------------|--|----------------------|--------------|--------------|----------------|---------|
|              |             |             |                                     | Theory   | Practical/<br>Seminar | Skill Development<br>Activities (Hours<br>are for Interaction<br>between<br>faculty and<br>students) | Duration<br>in hours | CIE<br>Marks | SEE<br>Marks | Total<br>Marks |         |
|              |             |             |                                     | L  | P                     | SDA  |                      |              |              |                |         |
| 1            | BSC         | 22PMAT11    | Linear Algebra & Probability Theory | 3  | 0                     | 0  | 3                    | 50           | 50           | 100            | 3       |
| 2            | IPCC        | 22PCS12     | Advanced Computer Networks          | 3  | 2                     | 0  | 3                    | 50           | 50           | 100            | 4       |
| 3            | PCC         | 22PCS13     | Digital Image Processing            | 3  | 0                     | 2  | 3                    | 50           | 50           | 100            | 4       |
| 4            | PCC         | 22PCS14     | Internet of Things                  | 3  | 0                     | 0  | 3                    | 50           | 50           | 100            | 3       |
| 5            | PCC         | 22PCS15     | Artificial Intelligence             | 3  | 0                     | 0  | 3                    | 50           | 50           | 100            | 3       |
| 6            | MCC         | 22RMI16     | Research Methodology and IPR        | 3  | 0                     | 0  | 3                    | 50           | 50           | 100            | 3       |
| 7            | PCCL        | 22PCS17     | Cyber Security Lab                  | 0  | 4                     | 0  | 3                    | 50           | 50           | 100            | 2       |
| 8            | AUD/<br>AEC | 22APCS18    | NPTEL/ MOOCS                        | Classes and evaluation procedures are as per the policy of the online course providers |                       |  |                      |              |              |                | PP      |
| <b>TOTAL</b> |             |             |                                     | 18   | 06                    | 2  | 21                   | 350          | 350          | 700            | 22      |

**Note:** BSC-Basic Science Courses, PCC: Professional core. IPCC-Integrated Professional Core Courses, MCC-Mandatory Credit Course, AUD/AEC–Audit Course/ Ability Enhancement Course (A pass in AUD/AEC is mandatory for the award of the degree)

Integrated Professional Core Course (IPCC): Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with practical of the same course. The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Audit Courses /Ability Enhancement Courses Suggested by BOS (ONLINE courses): Audit Courses: These are prerequisite courses suggested by the concerned Board of Studies. Ability Enhancement Courses will be suggested by the BoS if prerequisite courses are not required for the programs. Ability Enhancement Courses:

- These courses are prescribed to help students to enhance their skills in fields connected to the field of specialization as well allied fields that leads to employable skills. Involving in learning such courses are impetus o lifelong learning.
- The courses under this category are online courses published in advance and approved by the concerned Board of Studies.
- Registration to Audit/Ability Enhancement Courses Hall be done in consultation with the mentor and is compulsory during the concerned semester.
- In case a candidate fails to appear for the proctored examination or fails to pass the selected online course, he/she can register and appear for the same course if offered during then extension or register for a new course offered during that session, in consultation with the mentor.
- The Audit Ability Enhancement Course carries no credit and is not counted for vertical progression. However, a pass in such a course is mandatory for the Skill development activities: Under Skill development activities in a concerning course, the students should
  - Interact with industry (small, medium, and large).
  - Involve in research /testing/ projects to understand their problems and help creative and innovative methods to solve the problem.
  - Involve in case studies and field visits /fieldwork.
  - Accustom to the use of standards/codes etc., to narrow the gap between academia and industry.
  - Handle advanced instruments to enhance technical talent.
  - Gain confidence in modeling of systems and algorithms for transient and steady-state operations, thermal study, etc.
  - Work on different software/s (tools) to simulate, analyze and authenticate the output to interpret and conclude.

All activities should enhance student's abilities to employment and /or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc.

Students and the course instructor/s to involve either individually or in groups to interact together to enhance the learning and application skills of the study they have undertaken. The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.



**AUTONOMOUS SYLLABUS FOR M.Tech I SEMESTER 2022-2023**

| <b>Course Title: LINEAR ALGEBRA AND PROBABILITY THEORY</b>  |           |                       |
|---|-----------|-----------------------|
| SubjectCode: <b>22PCS11</b>   | Credit:3  | CIE: 50               |
| Number of Lecture Hours/Week  | 3(Theory) | SEE:50                |
| Total Number of Lecture Hours   | 42        | SEEHours:03           |
| <b>Prerequisites:</b> Probability Theory and statistics   |           |                       |
| <b>Course Objectives:</b>   |           |                       |
| <ul style="list-style-type: none"> <li>• Understand concepts and theorems on probability.</li> <li>• Able to know statistical concepts and Techniques.</li> <li>• Gain Knowledge of Eigen values, Eigen vectors and stochastic matrices.</li> <li>• Study probabilistic behavior of queues.</li> <li>• Study of mathematical model for communication</li> </ul> |           |                       |
| <b>MODULES</b>  |           | <b>Teaching Hours</b> |
| <b>Module I</b>   |           |                       |
| <b>Linear Algebra:</b> System of Linear Algebraic equations by triangularization method , Cholesky method, Partitions method, Gauss Jacobi, Gauss- Seidel's method and Power method for eigen values and eigen vectors.   |           | <b>09 Hrs</b>         |
| <b>Module II</b>  |           |                       |
| <b>Vector Spaces:</b> Geometry of system of linear equations, Vector spaces and subspaces, basis and dimension, four fundamental subspaces, Rank – Nullity theorem (without proof), linear transformation. Orthogonal Vectors and subspaces, projections and least squares, orthogonal bases and Gram-Schmidt orthogonalization.                                |           | <b>08 Hrs</b>         |
| <b>Module III</b>   |           |                       |
| <b>Probability-I:</b> Random variables, probability mass and probability distribution function, Probability distributions: Binomial, Normal and Gaussian distributions & examples.  |           | <b>08 Hrs</b>         |
| <b>Module IV</b>  |           |                       |
| <b>Probability-II:</b> Random variables, s, joint probability distribution (discrete and continuous)-Illustrative examples, Probability vectors, stochastic matrices, fixed points, regular stochastic matrices.  |           | <b>09 Hrs</b>         |
| <b>Module V</b>   |           |                       |
| <b>Sampling Theory:</b> Testing of hypothesis: t-distribution test, Chi square test and F-test. Analysis of Variance (ANOVA):one way classification   |           | <b>08Hrs</b>          |

**Question paper pattern:**

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module.

**Reference Books:**

1.S.S .Shastry, Introductory Methods of Numerical Analysis , PHI, 2005.

2.David C. Lay, “Linear Algebra and its applications”, 3<sup>rd</sup> Edition , Pearson Education, 2002.

3.H.K. Dash , Er. Rajnish Verma, “Higher Engineering Mathematics’, S.Chand Publishers, 3<sup>rd</sup> Edition,2014

4.Kenneth Hoffman and Ray Kunze, “Linear Algebra”, 2<sup>nd</sup> Edition, PHI, 2011

5.B.S. Grewal, “Numerical Methods in Engineering & Science”, Khanna Publishers, 2015.

6.R.D. Sharma, “Theory and problems of Linear Algebra”,I.K. International Publishing House Pvt. Ltd, 2010

**Course outcomes:**

**On completion of the course, the student will have the ability to:**

| Course Code | CO# | Course Outcome (CO)   | Blooms Level |
|-------------|-----|---|--------------|
| 22PCS11     | CO1 | Acquire the idea of significant figures, types of errors during numerical computation and Solve system of linear equations using direct and iterative methods.                      | C2           |
|             | CO2 | Estimate orthogonality of vector spaces, Cumulative distribution function and characteristic function. Recognize problems which involve these concepts in Engineering applications. | C2           |
|             | CO3 | Describe the basic notions of discrete and continuous probability distributions.  | C5           |
|             | CO4 | Describe the basic notions of discrete and continuous joint probability distributions.  | C3           |
|             | CO5 | Understand statistical and probabilistic concepts required to test the hypothesis   | C5           |

|  |                            |                       |
|--|----------------------------|-----------------------|
| <b>Course Title: ADVANCED COMPUTER NETWORKS</b>  |                            |                       |
| SubjectCode:22PCS12  | Credit:4                   | CIE: 50               |
| Number of Lecture Hours/Week   | 3(Theory) 2 hrs(Practical) | SEE:50                |
| Total Number of Lecture Hours  | <b>52</b>                  | SEEHours:03           |
| <b>Prerequisites:</b> Computer Networks.   |                            |                       |
| <b>Course Objectives:</b>  |                            |                       |
| <ul style="list-style-type: none"> <li>• Review the underlying concepts of data communication and computer network</li> <li>• Gain knowledge about functions of data link layer and related protocols and describe working of simple LAN with hubs, bridges and switches</li> <li>• Learn Internetworking with emphasis on routing protocols, architectures and implementation issues</li> <li>• Learn functions of transport layer, study congestion control mechanisms and build network applications using TCP/IP model.</li> </ul>   |                            |                       |
| <b>MODULES</b>   |                            | <b>Teaching Hours</b> |
| <b>Module I</b>  |                            | <b>11Hrs</b>          |
| <p><b>Review of Basic Concepts&amp; Direct Link Networks:</b> Building a Network; Requirements- Connectivity, Cost-Effective Resource Sharing support for Common Services; Network Architecture-Layering and Protocols, OSI Architecture, Internet Architecture; Performance-Band width and Latency, Delay <math>\times</math> Bandwidth Product, High-Speed Networks. Hardware Building Blocks-nodes, links; Encoding (NRZ, NRZI, Manchester, 4B / 5B), Framing, Error Detection -Two-Dimensional Parity, Internet checksum Algorithm, cyclic Redundancy Check; reliable Transmission Stop-and-Wait, Sliding Window, Concurrent Logical Channels; Ethernet (802.3), Rings(802.5,FDDI)-Token Ring Media Access Control, Token Ring Maintenance, FDDI.</p> <p><b>Implement the following using C/C++/Java or equivalent with LINUX/ Windows environment.</b></p> <ul style="list-style-type: none"> <li>• Implement internet checksum and CRC algorithm</li> <li>• Implement sliding window Protocol</li> </ul> |                            |                       |
| <b>Module II</b>   |                            | <b>10 Hrs</b>         |
| <p><b>Packet Switching:</b> Switching and forwarding – Datagrams, Virtual Circuit Switching, Source Routing; Bridges and LAN Switches-Learning Bridges, Spanning Tree Algorithm, Broadcast and Multicast, Limitations of Bridges; cell switching (ATM) – Cells, Segmentation and Reassembly, Virtual Paths, Physical Layers for ATM. Simple internetworking (IP)-What is an Internet work? Service Model, Global Address, Datagram Forwarding in IP.</p> <ul style="list-style-type: none"> <li>• Demonstrate IP datagram forwarding algorithm.</li> <li>• Implement Spanning tree algorithm</li> </ul>  |                            |                       |

|   |               |
|---|---------------|
| <p style="text-align: center;"><b>Module III</b></p> <p><b>Internetworking:</b> Address Translation(ARP), Host configuration(DHCP),Error Reporting (ICMP), Virtual Networks and Tunnels, Network as a Graph, distance Vector (RIP), Link State (OSPF), Metrics, Routing for Mobile Hosts, Global Internet–Subnetting, Classless Routing(CIDR), Interdomain Routing (BGP), Routing Areas, IP Version 6(IPv6); Multiprotocol Label Switching (MPLS).</p> <ul style="list-style-type: none"> <li>• Configuring RIP</li> <li>• Configuring a Cisco Router as a DHCP server</li> </ul>   | <b>10 Hrs</b> |
| <p style="text-align: center;"><b>Module IV</b></p> <p><b>End-to-End Protocols &amp; Resource Allocation:</b> Simple demultiplexer (UDP); Reliable byte stream (TCP)–End-to-End Issues, Segment Format, Connection Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, record Boundaries, TCP Extensions, Alternative Design Choices, Issues in resource allocation–Network Model, Taxonomy, Evaluation Criteria; Queuing disciplines.</p> <ul style="list-style-type: none"> <li>• Implement queuing Disciplines</li> </ul>   | <b>10Hrs</b>  |
| <p style="text-align: center;"><b>Module V</b></p> <p><b>Congestion Control &amp; Application:</b> TCP Congestion Control–Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery; Congestion-Avoidance mechanisms–DEC bit, Random Early Detection (RED), Source-Based Congestion Control. Traditional applications–Electronic Mail (SMTP, MIME, IMAP),World Wide Web(HTTP), Name Service(DNS), Network management(SNMP); Web services–Custom APPLICATION Protocols (WSDL, SOAP),A Generic application Protocol (REST).</p> <ul style="list-style-type: none"> <li>• Configure SMTP ,DNS using Cisco packet tracer</li> </ul> | <b>11Hrs</b>  |
| <p><b>Question paper pattern:</b><br/> The question paper will have ten questions.<br/> There will be 2 questions from each module, covering all the topics from a module.<br/> The students will have to answer 5 full questions, selecting one full question from each module.</p>  |               |
| <p><b>TEXTBOOKS:</b><br/> 1. Larry L. Peterson and Bruce S. Davie: Computer Networks–A Systems Approach, 4<sup>th</sup> Edition, Elsevier,2007.</p>   |               |
| <p><b>REFERENCEBOOKS:</b><br/> 1. Behrouz A. Forouzan: Data CommunicationsandNetworking,4<sup>th</sup> Edition, Tata McGrawHill,2006.<br/> 2. William Stallings: Data and ComputerCommunication,8<sup>th</sup> Edition, Pearson Education,2007.<br/> 3. Alberto Leon- Garcia and Indra Widjaja: Communication Networks-Fundamental Concepts and KeyArchitectures,2<sup>nd</sup> Edition TataMcGraw-Hill,2004.</p>   |               |
| <p><b>Course outcomes:</b><br/> <b>On completion of the course, the student will have the ability to:</b></p>   |               |

| <b>Course Code</b> | <b>CO#</b> | <b>Course Outcome (CO)</b>   | <b>Blooms Level</b> |
|--------------------|------------|--|---------------------|
| <b>22PCS12</b>     | <b>CO1</b> | Explain architectural concepts of layering, error on troll techniques and analyze data link protocols their analysis | <b>C3</b>           |
|                    | <b>CO2</b> | Describe the working of LAN, bridges and switches  | <b>C2</b>           |
|                    | <b>CO3</b> | Describe principles of internetworking and illustrate internet routing protocols                                     | <b>C4</b>           |
|                    | <b>CO4</b> | Explain working of transport layer protocols and resource allocation   | <b>C2</b>           |
|                    | <b>CO5</b> | Explain TCP congestion control techniques and application layer protocols  | <b>C5</b>           |

| <b>Course Title: DIGITAL IMAGE PROCESSING</b>  |                                  |                       |
|--|----------------------------------|-----------------------|
| Subject Code: <b>22PCS13</b>   | Credit:4                         | CIE:50                |
| Number of Lecture Hours/Week   | <b>3 hrs (Th) + 02 Hrs (SDA)</b> | SEE:50                |
| Total Number of Lecture Hours  | 52                               | SEEHours:03           |
| <b>Prerequisites:</b> Concepts of Digital Signal Processing  |                                  |                       |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• To Study the Image fundamental and mathematical transformations necessary for image processing</li> <li>• Understand the image enhancement techniques, image restoration and compression techniques</li> </ul>  |                                  |                       |
| <b>MODULES</b>   |                                  | <b>Teaching Hours</b> |
| <b>Module– I</b><br><b>Digital image fundamentals:</b> Introduction, Examples of fields that use Digital image processing, Fundamental steps in Digital image Processing, Image sensing and acquisition, A simple image formation model, Image Sampling & Quantization, basic relationships between pixels.<br><b>Activities:</b> <ol style="list-style-type: none"> <li>1. Simulation and Display of an Image, Negative of an Image (Binary &amp; Gray Scale)</li> <li>2. Implementation of Relationships between pixels</li> </ol>   |                                  | <b>10 Hrs</b>         |
| <b>Module– II</b><br><b>Background on MATLAB and image processing toolbox:</b> Background on MATLAB and Image processing Toolbox, MATLAB working environment, Digital image representation, Reading, displaying and writing images, data classes, image types, converting between data classes and image types, array indexing, some important standard arrays, introduction to M-function Programming.<br><b>Activities:</b> <ol style="list-style-type: none"> <li>1. Reading images and Writing images of Grayscale and RGB images.</li> <li>2. Show how the resolution changes can be done by using the desired Scaling factors.</li> </ol>  |                                  | <b>10 Hrs</b>         |
| <b>Module– III</b><br><b>Image Enhancement:</b> Background, Some basic gray level transformations : Image negatives, Log transformations, Power-law transformation, piece wise linear transformation, Histogram processing: Histogram equalization and matching, Local enhancement, Use of Histogram statistics, Basics of spatial filtering: Smoothing linear filters, Order statistics filters, Sharpening Spatial filters: Use of Second and First derivative for enhancement.<br><b>Activities:</b> <ol style="list-style-type: none"> <li>1. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image</li> <li>2. Implementation of Image Smoothing Filters (Mean and Median filtering of an Image)</li> </ol> |                                  | <b>11Hrs</b>          |

| 3. Implementation of image sharpening filters and Edge Detection using Gradient Filters.  |            |   |
|---|------------|---|
| 4. Contrast stretching of a low contrast image, Histogram and Histogram Equalization  |            |   |
| <b>Module– IV</b>   |            |   |
| <p><b>Image Restoration and Compression:</b> A model of the Image degradation/ Restoration Process, Noise models, Restoration in the presence of noise only spatial filtering, Estimating the degradation function, inverse filtering, Minimum mean square error (wiener) filtering, geometric transformation.</p> <p><b>Image compression:</b> Fundamentals, Image compression models, error free compression, lossy compression.</p> <p><b>Activities:</b></p> <ol style="list-style-type: none"> <li>1. Implementation of image restoring techniques</li> <li>2. Implementation of Image Intensity slicing technique for image enhancement</li> <li>3. Canny edge detection Algorithm</li> </ol> |            | <b>10 Hrs</b>   |
| <b>Module-V</b>   |            |   |
| <p><b>Image segmentation, Representation and Description:</b> Detection of discontinuities, edge linking and boundary detection, Thresholding, Region based segmentation.</p> <p><b>Representation and description:</b> Various schemes for representation, boundary descriptors and regional descriptors.</p>  |            | <b>11Hrs</b>  |
| <p><b>Question paper pattern:</b><br/> The question paper will have ten questions.<br/> There will be 2 questions from each module, covering all the topics from a module.<br/> The students will have to answer 5 full questions, selecting one full question from each module.</p>  |            |   |
| <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Rafael C. Gonzalez, Richard E wood, <i>Digital Image Processing Using MATLAB</i>, Pearson Education Publisher, 2007.</li> </ol>   |            |   |
| <p><b>Reference books:</b></p> <ol style="list-style-type: none"> <li>1. Anil K Jain, <i>Fundamentals of Digital Image Processing</i>, Pearson Education/Prentice-Hall of India Pvt. Ltd., 1997.</li> <li>2. B.Chanda, D Dutta Majumder, <i>Digital Image Processing and Analysis</i>, Prentice-Hall, India, 2002.</li> </ol>   |            |   |
| <p><b>Course outcomes:</b><br/> <b>On completion of the course, the student will have the ability to:</b></p>   |            |   |
| Course Code   | CO#        | Course Outcome(CO)  |
| <b>22PCS13</b>  | <b>CO1</b> | Review the fundamental concepts of Digital Image Processing System              |
|   | <b>CO2</b> | Analyze Images in the Space and Frequency domain using various transformations. |
|   | <b>CO3</b> | Explain the techniques for Image enhancement in frequency domain.               |
|   | <b>CO4</b> | Demonstrate various image restoration and compression techniques.               |
|   | <b>CO5</b> | Interpret Image segmentation, representation and description techniques.        |

|   |                  |                       |
|---|------------------|-----------------------|
| Course Title: <b>INTERNET OF THINGS</b>   |                  |                       |
| Subject Code: <b>22PCS14</b>  | Credit:3         | CIE:50                |
| Number of Lecture Hours/Week  | <b>3Hrs (Th)</b> | SEE:50                |
| Total Number of Lecture Hours   | 42 Hrs           | SEE Hours: 03         |
| <b>Pre-requisite:</b> Computer Networking and Wireless Sensor Networks, Electronic circuits   |                  |                       |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• Recognize basic issues, policy and challenges in the IoT</li> <li>• Illustrate Mechanism and Key Technologies in IoT</li> <li>• Clarify the Standard of the IoT, Resources in the IoT and Data analytics for IoT.</li> <li>• To gain knowledge of the Layer ½ and 3 connectivity of Mobile IPv6 technologies.</li> <li>• Identify research opportunities in IoT technology, applications and services.</li> </ul>  |                  |                       |
| <b>MODULES</b>  |                  | <b>Teaching Hours</b> |
| <b>Module I</b>   |                  |                       |
| <b>Internet Of Things overview Definitions And Frameworks:</b> Motivations Examples of Applications, IPv6 Role, Areas of Development and Standardization, Scope of the Present Investigation. IoT Definitions, General Observation, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities. Internet Of Things Application Examples: Overview, Smart Metering Advanced Metering Infrastructure, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking (Following and Monitoring Mobile Objects). |                  | <b>09 Hrs</b>         |
| <b>Module II</b>  |                  |                       |
| <b>Fundamental Iot Mechanisms and Key Technologies:</b> Identification of IoT Objects and Services, Structural Aspects of the IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, RFID Technology, Satellite Technology.   |                  | <b>08 Hrs</b>         |
| <b>Module III</b>   |                  |                       |
| <b>Evolving Iot Standards:</b> Overview and Approaches, IETF IPv6 Routing Protocol for RPL Roll , Constrained Application Protocol (CoAP), Background, Messaging Model, Request Response Model, Intermediaries and Caching, Representational State Transfer (REST), ETSIM2M, IETF IPv6 Over Low power WPAN (6LoWPAN), ZigBee IP (ZIP) , IP in Smart Objects(IPSO).  |                  | <b>08 Hrs</b>         |
| <b>Module IV</b>  |                  |                       |



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|--|-------------------|----------------------------------|
| <p><b>Layer 1/2 Connectivity: Wireless Technologies For The Iot :</b> WPAN Technologies for IoT M2M, Zigbee IEEE802.17.4, Radio Frequency for Consumer Electronics (RF4CE), Bluetooth and its Low-Energy Profile , IEEE 802.17.6 WBANs, IEEE 802.17 WPAN TG4j MBANs , ETSI TR 101 557 , NFC, Dedicated Short-Rang Communications (DSRC) and Related Protocols, Comparison of WPAN Technologies , Cellular and Mobile Network Technologies for IoT M2M, overview and Motivations Universal Mobile Telecommunications System, LTE.</p>   |                   | <p><b>(08 Hrs)</b></p>           |
| <p><b>Module V</b></p>   |                   |                                  |
| <p><b>Layer 3 Connectivity:</b> IPV6 Technologies For The Iot: Overview and Motivations, Address Capabilities, IPv4 Addressing and Issues, IPv6 Address Space, IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6, Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6, Technical Approaches, Residential Broadband Services in an IPv6 Environment Deployment Opportunities.<br/> <b>LAYER 3 CONNECTIVITY: MOBILE Ipv6 TECHNOLOGIES FOR THE Iot:</b> Overview, Protocol Details, Generic Mechanisms, New IPv6 Protocol, Message Types, and Destination Option, Modifications to IPv6 Neighbor Discovery, Requirements for Various IPv6 Nodes, Correspondent Node Operation, HA Node Operation, Mobile Node Operation, Relationship to IPV4 Mobile IPv4 (MIP).</p> |                   | <p><b>09Hrs</b></p>              |
| <p><b>Question paper pattern:</b><br/> The question paper will have ten questions.<br/> There will be 2 questions from each module, covering all the topics from a module.<br/> The students will have to answer 5 full questions, selecting one full question from each module.</p>   |                   |                                  |
| <p><b>Textbooks:</b><br/> 1. “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications” Author(s): Daniel Minoli.</p>   |                   |                                  |
| <p><b>Reference Books:</b><br/> 1. Designing the Internet of Things Adrian McEwen, Hakim Cassimally ISBN: 978-1-118-43062-0 November 2013, Wiley.<br/> 2. Charalampos Doukas, "Building Internet of Things with the Arduino", Create space, April 2002 <a href="http://postscapes.com/">http://postscapes.com/</a><br/> 3. “Architecting the Internet of Things” Uckelmann, Dieter, Harrison, Mark, Michahelles, Florian (Eds.) 2011, XXXI, Springer EBooks.</p>   |                   |                                  |
| <p><b>Course outcomes:</b><br/> <b>On completion of the course, the student will have the ability to:</b></p>  |                   |                                  |
| <p><b>Course Code</b></p>  | <p><b>CO#</b></p> | <p><b>Course Outcome(CO)</b></p> |

|                |            |  |
|----------------|------------|--|
| <b>22PCS14</b> | <b>CO1</b> | Explain internet of Things technology and relate it ubiquitous computing.                    |
|                | <b>CO2</b> | Identify the Definitions of IoT, frame works and examples of applications.                   |
|                | <b>CO3</b> | Demonstrate the fundament also of IoT mechanism, Key technologies an devolving IoT Standards |
|                | <b>CO4</b> | Illustratethe Layer 1/2and3 connectivity of wireless technologies                            |
|                | <b>CO5</b> | Compare IPv4 with IPv6 technologies and determine the Mobile IPv6 Technologies for the IoT.  |

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| <b>Course Title: ARTIFICIAL INTELLIGENCE</b>  |                  |                       |
| Subject Code: <b>22PCS15</b>  | <b>Credits:3</b> | CIE:50                |
| Number of Lecture Hours/Week  | <b>3 Hrs(Th)</b> | SEE:50                |
| Total Number of Lecture Hours   | 42 Hrs           | SEE Hours: 03         |
| <b>Prerequisite:</b> Working on Discrete mathematics, Programming ability and exposure to probability.  |                  |                       |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To have an understanding of the basic issues of knowledge representation and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.</li> <li>To have a basic understanding of advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning.</li> </ul>  |                  |                       |
| <b>MODULES</b>  |                  | <b>Teaching Hours</b> |
| <p style="text-align: center;"><b>Module I</b></p> <p><b>Artificial Intelligence:</b> The AI Problems, The underlying assumption, AI Technique. The Level of the model, Criteria for success, some general references, One final word and beyond.</p> <p><b>Problems, problem spaces, and search:</b> Defining, the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs, Additional Problems.</p> <p><b>Intelligent Agents:</b> Agents and Environments, The nature of environments, The structure of agents.</p>  |                  | <b>08Hrs</b>          |
| <p style="text-align: center;"><b>Module II</b></p> <p><b>Heuristics arch techniques:</b> Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis.</p> <p><b>Knowledge representation issues:</b> Representations and mappings, Approaches to knowledge representation, Issues in knowledge representation, The frame problem.</p> <p><b>Using predicate logic:</b> Representing simple facts I in logic, representing instance and ISA relationships, Computable functions and predicates, Resolution, Natural Deduction.</p> <p><b>Logical Agents:</b> Knowledge-based agents, the Wumpus world, Logic-Propositional logic, Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic.</p> |                  | <b>09Hrs</b>          |

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| <b>Module III</b>  |            |                            |
| <p><b>Symbolic Reasoning Under Uncertainty:</b> Introduction to non-monotonic reasoning, Logic for nonmonotonic reasoning, Implementation Issues, Augmenting problem-solver, Implementation: Depth-first search, Implementation: Breadth-first search.</p> <p><b>Statistical Reasoning:</b> Probability and bayes Theorem, Certainty factors and rule-based systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy logic.</p> <p><b>Quantifying Uncertainty:</b> Acting under uncertainty, Basic probability notation, Inference using full joint distributions, Independence, Bayes ‘rule And its use, The Wumpus world revisited.</p> |            | <b>08Hrs</b>               |
| <b>Module IV</b>   |            |                            |
| <p><b>Weak Slot-and-filter structures:</b> Semantic Nets, Frames. <b>Strong slot-and –filler structures:</b> Conceptual dependency, scripts, CYC.</p> <p><b>Adversarial Search:</b> Games, Optimal Decision in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-Of-The-Art Game Programs, Alternative Approaches, Summary.</p>  |            | <b>08Hrs</b>               |
| <b>Module V</b>  |            |                            |
| <p><b>Learning From examples:</b> Forms of learning, Supervised learning, learning decision trees, Evaluating and choosing the best hypothesis, The theory of learning, PAC, Regression and Classification with linear models, On parametric models, Support vector machines, Ensemble learning.</p> <p><b>Learning Probabilistic Models:</b> Statistical learning, learning with complete data, learning with hidden variables: The EM algorithm.</p>   |            | <b>09Hrs</b>               |
| <p><b>Question paper pattern:</b><br/> The question paper will have ten questions.<br/> There will be 2 questions from each module, covering all the topics from a module.<br/> The students will have to answer 5 full questions, selecting one full question from each module.</p>   |            |                            |
| <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Elaine Rich, Kevin Knight, Shivashanka B Nair: Artificial Intelligence, Tata MC Graw Hill 13<sup>rd</sup> edition. 2013</li> <li>2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3<sup>rd</sup> edition 2013.</li> </ol>   |            |                            |
| <p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. Nilsson: “Principles of Artificial Intelligence”, Elsevier, ISBN-13:9780934613101</li> </ol>   |            |                            |
| <b>Course Code</b>   | <b>CO#</b> | <b>Course Outcome (CO)</b> |

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|----------------|------------|--|
| <b>22PCS15</b> | <b>CO1</b> | Differentiate optimal reasoning Shuman like reasoning and Apply AI search Models   |
|                | <b>CO2</b> | Discuss of state space representation, exhaustive search, heuristic search along with the time and space complexities        |
|                | <b>CO3</b> | Explain Logic for representing Knowledge and Reasoning of AI systems.  |
|                | <b>CO4</b> | Design different learning algorithms for improving the performance of AI Systems.  |
|                | <b>CO5</b> | Apply techniques of AI in speech recognition, Expert Systems, Machine Learning and Natural Language Processing and Robotics. |

| <b>Course Title: RESEARCH METHODOLOGY AND IPR</b>   |                   |                       |
|---|-------------------|-----------------------|
| Subject Code: <b>22PCS16</b>  | <b>Credits:3</b>  | CIE:50                |
| Number of Lecture Hours/Week  | <b>3 Hrs (Th)</b> | SEE:50                |
| Total Number of Lecture Hours   | 52                | SEE Hours: 03         |
| <b>Prerequisite:</b> Working on Discrete mathematics, Programming ability and exposure to probability.  |                   |                       |
| <b>Course Objectives:</b>   |                   |                       |
| •   |                   |                       |
| <b>MODULES</b>  |                   | <b>Teaching Hours</b> |
| <b>Module I</b><br>Meaning, Objectives and characteristic of research methods Vs Methodology. Types of Research - Descriptive Vs Analytical, Applied Vs Fundamental Quantities Vs Qualitative, Conceptual Vs Empirical -Research process. - Criteria of good research-Developing a research plan.<br><b>Defining the research problem</b> - Selecting the problem. Necessity of defining the problem Techniques involved in defining the problem- Importance of literature review in defining a problem |                   | <b>10 Hrs</b>         |
| <b>Module II</b><br><b>Literature review in defining a problem</b> - Survey of literature - Primary and Secondary sources Reviews, treatise monographs patents- web as a source- searching the web-Identifying gap areas from literature review Development of working hypothesis.<br><b>Research design</b> and methods - Research design - Basic principles. Need of research design Features of good design- Important concepts relating to research design - Observation and Facts.                 |                   | <b>10 Hrs</b>         |
| <b>Module III</b><br><b>Research Design:</b> Diagnosis and Experimentation Determining Experimental and simple designs.<br><b>Sample design</b> - Steps in sample design - Characteristics of a good sample design - Types of sample design- Measurement and scaling techniques. Methods of data collection-collection of primary data -Data collection instruments.  |                   | <b>12 Hrs</b>         |
| <b>Module IV</b><br>Testing hypotheses –Basic concepts-Procedure for hypothesis testing flow diagram for hypotheses testing-Data analysis with statistical packages- correlation and regression- Important parametric test-Chi- square test- Analysis of variance and covariance.   |                   | <b>10 Hrs</b>         |

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| <b>Interpretation and Report Writing:</b> Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.  |            |   |
| <b>Module V</b><br><b>Intellectual Property:</b> The Concept, Intellectual Property System in India, Development of TRIPS complied Regime in India, Patents Act,1970,,Trade Mark Act ,1999,The designs Act 2000,The Geographical Indications of Goods(Registration and Protection)Act 1999,Copyright Act 1957,The protection of plant varieties and farmers’ Right Act 2001,Layout Design Act 2000,Trade Secrets, World Intellectual Property Organization(WIPO),WIPO and WTO,Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, common Rules Patent Marks, Industrial Designs, Trade Names, Indications of Source Unfair competition, Patent Cooperation Treaty(PCT),advantages of PCT Filing Copyright and related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable subject matter, Rights conferred, Exceptions, Term of protection, Conditions on Patent Applicants. |            | <b>10 Hrs</b>   |
| <b>Question paper pattern:</b><br>The question paper will have ten questions.<br>There will be 2 questions from each module, covering all the topics from a module.<br>The students will have to answer 5 full questions, selecting one full question from each module.   |            |   |
| <b>TEXT BOOKS.</b><br>1. Research Methodology: Methods and Techniques C.R.Kothari, Gaurav Garg New Age International 4 <sup>th</sup> Edition,2018.<br>2. Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3 <sup>rd</sup> Edition,2011.<br>3. Study Material (For the topic Intellectual Property under module 5) Professional Programmed Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.  |            |   |
| <b>REFERENCEBOOKS:</b><br>1. Research Methods: The concise knowledge base Trochim Atomic DogPublishing 2005.<br>2. Conducting Research Literature Reviews:From the Internet to Paper Fink A Sage Publications 2009  |            |   |
| <b>Course Code</b>  | <b>CO#</b> | <b>Course Outcome (CO)</b>  |
|   | <b>CO1</b> | Discussresearchmethodologyandthetechniqueofdefiningaresearchproblem |

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| <b>22PCS16</b> | <b>CO2</b> | Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frame works and writing are view. |
|                | <b>CO3</b> | Explain various research designs and their characteristics.   |
|                | <b>CO4</b> | Explain the art of interpretation and the art of writing research reports   |



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|---|-------------------------------------|------------------------|
| <b>Course Title: CYBER SECURITY LAB</b>   |                                     |                        |
| Subject Code: <b>22PCS17</b>  | Credit:1                            | CIE:50                 |
| Number of Practical Hours/Week  | <b>1Hrs (Th) + 2 Hrs(Practical)</b> | SEE:50                 |
|   |                                     | SEEHours:03            |
| <b>Prerequisites: Computer Networks</b>   |                                     |                        |
| <b>Course Objectives:</b><br>The objective of the course is to study different tools in security analysis of web applications and perform vulnerability analysis.   |                                     |                        |
| <b>List of Programs</b>   |                                     | <b>Practical Hours</b> |
| <ol style="list-style-type: none"> <li>1. Analyze different coding (Base64, URL, HTML) and encryption (MD5, SHA1, SHA2 etc) mechanisms used in application.</li> <li>2. Build as item a pusing the application mentioned for analysis.</li> <li>3. Experiment to perform web application mirroring using HTTrack.</li> <li>4. Build a checklist for Authentication and apply on the web application to analyze the outcomes.</li> <li>5. Build a check list for Session management and use the same to perform manual check on another application.</li> <li>6. Experiment to perform Session Hijacking using Web-Goat</li> <li>7. List Horizontal access Controls in the application and bypass the roles based functionalities</li> <li>8. Experiment to perform SQL Injection in application using manual and automated tools.</li> <li>9. Experiment to perform OS Command Injection in application and extend the attack to gain web shell access.</li> <li>10. Build a check list for file path traversal attacks to access the server internal files.</li> <li>11. Experiment to Analyse XML Parsers working in the application using XML External Entities.</li> <li>12. Find Business Login flaw using iven applications.</li> </ol> |                                     |                        |

13. Write a program to identify open ports in the IP address
14. Create a reverse shell for connecting from the victim machine.
15. Bypass file upload validation and gain web shell access to the server.
16. Execute Cross-Site Scripting in the application and using the same perform Session Hijacking.

**Note: For SEE, students will be asked to do similar programs**

**Course outcomes:**

**On completion of the course, the student will have the ability to:**

| <b>Course Code</b> | <b>CO#</b> | <b>Course Outcome (CO)</b>   |
|--------------------|------------|--|
| <b>22PCS17</b>     | <b>CO1</b> | Analyze web application/protocols from security perspective.                                   |
|                    | <b>CO2</b> | Demonstrate use of tools used in security analysis.  |
|                    | <b>CO3</b> | Illustrate flaws in authentication management, session management and vertical access control. |
|                    | <b>CO4</b> | Conduct SQL and OS injection in a ethical manner   |
|                    | <b>CO5</b> | Demonstrate file path traversal attack and analyze XML parser.                                 |