Scheme & Syllabus
of
M.Tech in Computer Science & Engineering
(With effect from 2020-2021 Academic year)

Outcome Based Education
with
Choice Based Credit System

P.E.S. College of Engineering, Mandya - 571 401, Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi
Grant -in- Aid Institution (Government of Karnataka), World Bank Funded College (TEQIP)
Accredited by NBA & NAAC and Approved by AICTE, New Delhi.)

Ph : 08232- 220043, Fax : 08232 – 222075, Web : www.pescemandya.org
Preface

PES College of Engineering, Mandya, started in the year 1962, has become autonomous in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running 6 Postgraduate programs. It consists of 4 M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has become a Permanent Member by signing the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations such as Taiwan, Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan are among 16 signatories to the international agreement besides the US and the UK. Implementation of Outcome Based Education (OBE), has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted Credit Based system (CBCS) based semester Structure with OBE Scheme and grading system which provides the flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. There lies a shift in thinking, teaching and learning process moving towards students Centric from Teachers Centric Education which enhances the knowledge, skills & moral values of each student.

Choice Based Credit System (CBCS) provides the options for the students to select from the number of prescribed courses. The CBCS provides a ‘cafeteria’ type approach in which the students can choose electives from a wide range of courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, adopt an interdisciplinary approach for learning which enables integration of concepts, theories, techniques. These are greatly enhances the skill/employability of students.

In order to increase the Industry Institute Interaction, Internship have been added to the existing curriculum of 2020-21. Further, Research Methodology & IPR and two Self Study Courses have been introduced to enhance their Research ability and Self Learning ability respectively. Lab Components are also included in I & II Semester.

(Dr. D.R.Umesh)  (Dr. Dr. Nagarathna)
Deputy Dean (Academic)       Dean (Academic)
Associate Professor           Professor
Dept. of Computer Science & Engg. Dept. of Computer Science & Engg.
P.E.S. College of Engineering, Mandya

VISION

“PESCE shall be a leading institution imparting quality Engineering and Management education developing creative and socially responsible professionals

MISSION

• Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
• Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
• Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
• Promote research, product development and industry-institution interaction.

Department of Computer Science and Engineering

The Vision of the department is:
“The Department of Computer Science and Engineering shall create professionally competent and socially responsible engineers capable of working in global environment.”

The mission of the department is:
DM1: Enforce best practices in teaching-learning, with dedicated faculty and supportive infrastructure to impart the knowledge in emerging technologies.
{Required to create professionally competent engineers}
DM2: Improve Industry-Institute relationship for mutual benefit.
{Required to create professionally competent engineers}
DM3: Inculcate ethical values, communication and entrepreneurial skills.
{Required to create professionally competent and socially responsible engineers}
DM4: Sensitize social, legal, environmental and cultural diversity issues through professional training and balanced curriculum.
{Required to create engineers capable of working in global environment}

Program Outcomes (POs)

The graduates of M. Tech. in Computer Science and Engineering (CSE) Program will be able to:
1. Student can independently carry out investigation and feasibility work to solve real time practical problems.
2. Student had Ability to Write and Present a substantial technical article report/document.
3. Apply knowledge of recent computing technologies, skills and current tools of computer science and engineering.
4. Student can Design software systems, components, or processes to meet identified needs within economic, environmental and social constraints.
5. Student can build capability to work in multidisciplinary and multicultural environment with professional, social and ethical responsibilities.
6. Recognize the need to engage in lifelong learning through continuing education and research.
About the Department: The Department of Computer Science and Engineering was established in 1983. The department offers B.E. program with an intake of 120 students, M.Tech. in Computer Science and Engineering with 18 students, M.Tech. in Computer Engineering with 24 students and also Ph.D. programme. Currently the strength of teaching faculty is 32 and that of non teaching staff is 14. The teacher - student ratio is 1:15. The department has a research centre under VTU and University of Mysore, with 7 research guides and 8 research students. During the last five years, the department has published more than 200 technical papers in International / National Journals / Conferences. So far, the department has organized four international and 8 national conferences. The department is equipped with all the required infrastructure, laboratories, class rooms, departmental library. The departments wish to achieve the mission of developing and nourishing computer science engineers through well-trained, committed and experienced faculty members. Faculty members of the departments are involved in research activities in different fields such as Image Processing, Pattern Recognition, Data Mining, Wireless Networks, Big Data Analytics and Computer Vision.

Short Term Goals:
1. Strengthening of Infrastructure
2. Faculty development programmes
3. Encourage academic excellence
4. Project proposals to raise funded projects

Mid Term Goals:
1. Establishing centre of excellence
2. Conducting international conference
3. Establish industry-institute interaction

Long Term Goals:
1. Patents filing
2. Establishing new laboratories

Credit pattern
Programme: M.Tech Computer Science & Engineering

<table>
<thead>
<tr>
<th>Core Courses</th>
<th>I Semester</th>
<th>12 credits</th>
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<tbody>
<tr>
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<td>II Semester</td>
<td>12 credits</td>
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<tr>
<td>Elective Course</td>
<td>I Semester</td>
<td>08 credits</td>
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<tr>
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<td>II Semester</td>
<td>08 credits</td>
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<td>Technical Seminar</td>
<td>III Semester</td>
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</tr>
<tr>
<td>Lab</td>
<td>I Semester</td>
<td>02 credits</td>
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<tr>
<td></td>
<td>II Semester</td>
<td>02 credits</td>
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<tr>
<td>Internship</td>
<td>III Semester</td>
<td>06 credits</td>
</tr>
<tr>
<td>Research Methodology and IPR</td>
<td>III Semester</td>
<td>04 credits</td>
</tr>
<tr>
<td>Self Study Course</td>
<td>III Semester</td>
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<tr>
<td>Project work</td>
<td>II Semester</td>
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<td>III Semester</td>
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<td>Project work</td>
<td>IV Semester</td>
<td>18 credits</td>
</tr>
<tr>
<td>Mini Project</td>
<td>I Semester</td>
<td>02 credits</td>
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</table>

A total of 88 credits for 2 years
### Teaching and Examination for M.Tech. Computer Science & Engineering

#### I Semester M.Tech. Computer Science & Engineering

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Teaching Hours/Week</th>
<th>Examination Marks</th>
<th>Credits</th>
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<tbody>
<tr>
<td></td>
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<td>Theory</td>
<td>Tutorial</td>
<td>Practical / Field work / Assignment</td>
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<tr>
<td>1.</td>
<td>P20MCSE11</td>
<td>Advanced Algorithms</td>
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<tr>
<td>2.</td>
<td>P20MCSE12</td>
<td>Network Programming</td>
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<td>Internet of Things</td>
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<td>Professional Elective – I</td>
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<td>P20MCSE15X</td>
<td>Professional Elective – II</td>
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<tr>
<td>6.</td>
<td>P20MCSEL16</td>
<td>Advanced Algorithms Lab</td>
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<td>7.</td>
<td>P20MCSE17</td>
<td>Mini Project</td>
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#### Professional Elective I

<table>
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<tr>
<th>Sl. No.</th>
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<tr>
<td>1.</td>
<td>P20MCSE141</td>
<td>Artificial Intelligence</td>
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<td>2.</td>
<td>P20MCSE142</td>
<td>Probability &amp; Statistics</td>
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<td>Artificial Intelligence</td>
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<tr>
<td>2.</td>
<td>P20MCSE142</td>
<td>Probability &amp; Statistics</td>
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#### II Semester M.Tech. Computer Science & Engineering

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<td>1.</td>
<td>P20MCSE21</td>
<td>Data Science</td>
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<td>2.</td>
<td>P20MCSE22</td>
<td>Multicore Architecture &amp; Programming</td>
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<td>Block Chain Technologies</td>
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<td>Data Science Lab</td>
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#### Professional Elective III

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<th>Credits</th>
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<td>P20MCSE241</td>
<td>Deep Learning</td>
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<td>2.</td>
<td>P20MCSE242</td>
<td>Business Intelligence &amp; its Application</td>
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#### Professional Elective IV

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<td>P20MCSE241</td>
<td>Deep Learning</td>
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<tr>
<td>2.</td>
<td>P20MCSE242</td>
<td>Business Intelligence &amp; its Application</td>
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### III Semester M.Tech. Computer Science & Engineering

<table>
<thead>
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<th>Examination Marks</th>
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<td>Practical / Field work / Assignment</td>
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<td>1.</td>
<td>P20MCSE31</td>
<td>Research Methodology and IPR [Common to all PG Programs]</td>
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<td>P20MCSE33</td>
<td>Self-Study Course - II</td>
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<td>P20MCSE34</td>
<td>Technical Seminar</td>
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<td>6.</td>
<td>P20MCSE36</td>
<td>Internship (Completed during the intervening vacation of I and II semesters and/or II and III semesters)</td>
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### IV Semester M.Tech. Computer Science & Engineering

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<td>P20MCSE41</td>
<td>Project Phase – III</td>
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<td>2.</td>
<td>P20MCSE42</td>
<td>Project Thesis Evaluation</td>
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<td>3.</td>
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<td>Project Viva - Voce</td>
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<td>4.</td>
<td>P20MCSE44</td>
<td>Term Paper</td>
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</table>

**Category of Courses:**

1. **Core Courses:** The Core courses constitute the core of the programme of study. Core courses are to be compulsorily studied by a student and are mandatory to complete them to fulfill the requirements of a programme.

2. **Professional Electives:** Elective courses offer a choice of advanced or specialized courses related to the programme of study. They enable students to specialize in a domain of interest or tune their learning to suit career needs and current trends.

3. **Laboratories:** The Laboratories are evaluated for 100 marks which includes CIE: 50 marks & SEE: 50 marks. The assessment of CIE is done with execution of lab programs & report submission. The final SEE assessment is done with the conduction of exam and Viva-Voce.

4. **Self-Study Course:** The Self-Study Course should be chosen from the available 12 weeks NPTEL online courses recommended by the Department. The student can undergo NPTEL
course registration during II / III Semester and the credit will be considered in III Semester. The 100 marks CIE assessment is based on the final NPTEL score (i.e. Online assignments: 25% + Proctored exam: 75%). The NPTEL score will be mapped directly to the CIE marks only if he /she has completed the NPTEL course (i.e. Certification). Those, who do not take-up/ Complete the NPTEL course shall be declared as failed and have to complete during the subsequent examination after satisfying the NPTEL requirements.

5. Internship: All the students have to undergo mandatory internship of 8 weeks during the vacation of I and II semesters and / or II and III semesters. An examination shall be conducted during III semester and the prescribed credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/ Complete the internship shall be declared as failed and have to complete during the subsequent examination after satisfying the internship requirements.

6. Technical Seminar: CIE marks shall be awarded by a committee comprising of HOD as Chairman, Guide/co-guide, in any and a senior faculty of the department. Participation in seminar by all postgraduate students of the same and other semesters of the programme shall be mandatory. The CIE marks awarded for Technical Seminar, shall be based on the evaluation of Seminar Report, Presentation skill and Question and Answer session in the ratio 50:25:25.

7. Mini Project:

- Mini Project shall comprise of an exercise assigned to a student similar to major projects.
- The topics may be related to the field of their UG Programme, that address the social issues.
- A report (not less than 20 A4 pages) to be submitted, detailing the solution to the problem / concept worked out during the semester.
- The work may be evaluated for award of Internal Assessment marks (CIE) based on a presentation / demonstration and viva voce, by a committee coordinated by the Course coordinators.

8. Project Work: The Project Work carries 22 credits and spreads over THREE semesters, i.e. during II, III and IV semesters. Project work Phase-I, 2 & 3 to be awarded by the Department committee constituted for the purpose.

- The Project Phase-I evaluation shall be of 100 marks CIE. It is based on the submission report consisting of Title, Introduction, Literature Survey, Objectives and Methodology (50 Marks) and Presentation (50 marks).
- The Project Phase-II evaluation shall be of 100 marks CIE. It is based on submission report consisting of theoretical analysis and design approach of the work (50 Marks) and Presentation for 50 marks.
- The Project Phase-III evaluation shall be of 100 marks CIE. It is based on the overall completion &demonstration / execution of the project (50 Marks) and presentation for 50 marks.
- The Project Phase-IV [Thesis] evaluation shall be of 100 marks each for CIE & SEE. The Thesis Evaluation done by Internal Examiner & External Examiner shall be considered for CIE & SEE marks respectively.

- The Project Phase-V [Viva Voce] evaluation shall be of 100 marks SEE. It is based on Thesis presentation and project viva voce has to be conducted jointly by internal and external examiner for a total of 100 marks SEE.

9. Term Paper: The term paper is purely based on the project work he/she chooses.

- The Term paper shall be for 100 marks CIE only. It has to be evaluated by the committee formed by HOD consisting of PG coordinator, guide and subject expert internal/external for each candidate.

- The term paper evaluation is based on the publication of an article in peer reviewed conference/journal (national/international) and quality of the journal. If the term paper is not published by the candidate or the same is communicated for publication at the end of his/her tenure, then the committee formed by HOD consisting of PG coordinator, guide and subject expert internal/external for each candidate will assess for the award of credit.
Course Title: Advanced Algorithms

Course Code: P20MCSE11  Sem: I  L-T-P-H: 4:0:0:4  Credits - 4
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs  Weightage: CIE:50; SEE:50

Course Learning Objectives (CLO’s)

The course P20MCSE11 aims to:
1. Solve optimization problems using greedy method.
4. Estimate optimal solution for the problem using approximation algorithms.
5. To make arbitrary choices for the problem using Randomized Algorithms.

Course Content

Unit -1


THE GREEDY METHOD: The 2-way merge problem, The minimum cycle basis problem solved by the greedy algorithm, The 2-terminal one to any problem solved by the greedy method.

Self-Study Component: Kruskal’s method to find a minimum spanning tree, Prim’s method to find a minimum spanning tree.

10 Hours

Unit -2


10 Hours

Unit -3

PRUNE-AND-SEARCH: The general method, The selection problem, Linear programming with two variables.


Self-Study Component: 0/1 knapsack problem, The optimal binary tree problem.

11 Hours

Unit -4


**Self-Study Component:** The polynomial time approximation scheme, NPO-completeness.

10 Hours

**Unit -5**

**RANDOMIZED ALGORITHMS:** A randomized algorithm to solve the closest pair problem, The average performance of the randomized closest pair problem, A randomized algorithm to test whether a number is a prime, A randomized algorithm for pattern matching, A randomized algorithm for interactive proofs, A randomized linear time algorithm for minimum spanning trees.

**ON-LINE ALGORITHMS:** The on-line Euclidean spanning tree problem solved by the greedy method, The on-line k-server problem and a greedy algorithm to solve this problem defined on planar trees.

**Self-Study Component:** An on-line obstacle traversal algorithm based on the balance strategy, The on-line bipartite matching problem solved by the compensation strategy.

11 Hours

**Course outcomes:**
1. Analyze and find the complexity of the given problem.
3. Design and analyze algorithms to optimization problems.
5. Apply randomized algorithms for the given problem.

**Textbooks**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Title of the book</th>
<th>Name of the Author/s</th>
<th>Publisher Name</th>
<th>Edition and year</th>
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**Reference Books**

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<tbody>
<tr>
<td>3</td>
<td>Data structures and algorithms</td>
<td>Aho, Hopcroft and Ullman</td>
<td>Pearson Education.</td>
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**Course Articulation Matrix(CAM) -Advanced Algorithms – P20MCSE11**

<table>
<thead>
<tr>
<th>Course Outcomes (CO’s)</th>
<th>Program Outcomes(PO’s)</th>
<th>PSO’s</th>
</tr>
</thead>
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<td>CO – 1</td>
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<td>CO – 5</td>
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</table>
The course P20MCSE12 aims to:
1. Demonstrate mastery of main protocols comprising the Internet.
2. Develop skills in network programming techniques.
3. Implement network services that communicate through the Internet.
4. Apply the client-server model in networking application.
5. Create client and server applications using the "Sockets" API.

Course Content

Unit -1
Introduction to network application, client/server communication, OSI Model, BSD Networking history, Test Networks and Hosts, Unix Standards, 64-bit architectures,

Self-Study Component: -Transport Layer: TCP, UDP and SCTP.

10 Hours

Unit – 2
Sockets Introduction – socket address structures, value-result arguments, byte ordering and manipulation functions, address conversion functions, Elementary TCP Sockets – socket, connect, bind, listen, accept , fork and concurrent server design, getsockname and getpeername functions and TCP Client/Server Example- client/server programming through TCP sockets, Normal startup, termination.

Self-Study Component: -POSIX signal handling, Signal handling in server, Crashing, rebooting of server host, shutdown.

11 Hours

Unit – 3
I/O Multiplexing and Socket Options, Elementary SCTP Sockets- Interface Models, sctp_xx functions, shutdown function, Notifications, SCTP Client/Server Examples – One-to-Many, Head–of–Line Blocking, Controlling number of streams and Termination.

Self-Study Component: - IPv4 and IPv6 Interoperability–different interoperability scenarios.

10 Hours

Unit – 4
Daemon Processes, syslogd, daemonizing functions and the inetd super server, Advanced I/O functions- readv, writev, sendmsg and recvmsg, Ancillary data, Advanced polling, Unix domain protocols- socket address structure, functions and communication scenarios.

Self-Study Component: -Nonblocking I/O – connect and accept examples.

10 Hours

Unit – 5
ioctl operations- socket, file, interface configuration information, ARP cache and routing table operations, Routing sockets- data link socket address structure, reading and writing, sysockt operations, interface name and index functions, Key Management functions – reading, writing, SADB, SA, Dynamically Maintaining SA’s, Out-of-Band data, Threads- basic thread functions, TCP echo server using threads.

Self-Study Component: - Mutexes and Conditional variables.

11 Hours

Course outcomes:
1. Understand client/server communication through Transport Layer protocols.
2. Develop applications that communicate with each other using TCP.
3. Develop applications that communicate with each other using SCTP.
4. Evaluate Socket Programming APIs.
5. Explain key management and routing sockets.

Textbooks

<table>
<thead>
<tr>
<th>Sl. No.</th>
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<tr>
<td>1</td>
<td>Network Programming in C</td>
<td>Barry Nance</td>
<td>PHI</td>
<td>2002</td>
</tr>
<tr>
<td>2</td>
<td>Windows Socket Network Programming</td>
<td>Bob Quinn, Dave Shute</td>
<td>Pearson</td>
<td>2003</td>
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</table>

Course Articulation Matrix(CAM) - Network Programming – P20MCSE12

<table>
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Course Title: Internet of Things

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<th>Sem: I</th>
<th>L-T-P-H: 4:0:0:4</th>
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Course Learning Objectives (CLO’s)

The course P20MCSE13 aims to:
1. Understand the definition and significance fundamentals of IoT.
2. Understand IoT Market Perspective.
3. Understand Knowledge about data acquired by the devices in IoT.
4. Discuss the architecture, operation and benefits of IoT.
5. Classify real world IoT design constraints, industrial automation in IoT.

Course Content

Unit -1

Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M : M2M, Difference between IOT and M2M.

Self-Study Component: SDN and NFV for IOT

10 Hours

Unit–2


Self-Study Component: IoT architecture outline

11 Hours

Unit–3

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics.

Self-Study Component: Knowledge Management

10 Hour

Unit–4


Self-Study Component: Deployment and Operational View

10 Hours

Unit–5


Self-Study Component: phase two- commercial building automation in the future.

11 Hour
Laboratory Component

Using Arduino Board
1. Demonstrate Using Arduino board to blink the LED continuously.
2. Demonstrate to show that how to fade an LED on pin 9 using analogwrite() function.
3. Demonstrate the use of switch and to control the ON and OFF of LED.
4. Demonstrate using arduino board to read the status of switch.

Using Raspberry Pi
1. Program to blink LED continuously.
2. Interfacing the PIR Motion Sensor to the Raspberry Pi’s input GPIO to detect motion.

Course Outcomes

Upon completion of this course, students will be able to
1. Explain the definition and understand the key components that makeup an IoT system.
2. Understand where the IoT concepts fit in future trends.
3. Compare and contrast the use of devices, gateways and data management in IoT.
4. Explain architecture in IoT.
5. Identify Real World Design Constraints.

Textbook/ Textbooks

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<tr>
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Reference Books


Course Articulation Matrix(CAM)- Internet of Things – P20MCSE13

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Course Title: Artificial Intelligence

Course Code: P20MCSE141 | Sem: I | L-T-P-H: 4:0:0:4 | Credits - 4
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs | Weightage: CIE:50; SEE:50

Course Learning Objectives (CLO’s)

The course P20MCSE141 aims to:
The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning. Students will implement a small AI system in a team environment.

Course Content

Unit -1

Solving problem by searching - Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions;
Adversarial Search - Alpha – Beta Pruning.

Self-Study Component: Solving problem by searching - Example Problems

12 Hour

Unit – 2

First-Order Logic - Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic;
Inference in First-Order Logic - Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Self-Study Component: Inference in First-Order Logic - Propositional vs. First-Order Inference.

10 Hour

Unit – 3

Quantifying Uncertainty - Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Baye’s Rule and Its Use;
Probabilistic Reasoning - Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks, Relational and First-Order Probability Models;
Probabilistic Reasoning over Time – Hidden Markov Models

Self-Study Component: Probabilistic Reasoning – Other Approaches to Uncertain Reasoning

10 Hour

Unit – 4

Learning from Examples – Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning.

Self-Study Component: Learning from Examples – Practical Machine Learning

10 Hour
Unit – 5

Knowledge in Learning – A Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming;

Learning Probabilistic Models – Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm;

Reinforcement Learning - Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search.

Self-Study Component: Reinforcement Learning - Applications of Reinforcement Learning

Course outcomes:

1. Define Artificial intelligence and identify problems for AI. Characterize the search techniques to solve problems and recognize the scope of classical search techniques
2. Define knowledge and its role in AI. Demonstrate the use of Logic in solving AI problems.
3. Demonstrate handling of uncertain knowledge and reasoning in probability theory.
4. Explain Learning methods in AI
5. Demonstrate Natural Language Processing and its application in Natural Language Communication

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<tr>
<td>1</td>
<td>Artificial Intelligence: A Modern Approach</td>
<td>Stuart Russell and Peter Norvig</td>
<td>Prentice Hall</td>
<td>3rd, 2009</td>
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Course Articulation Matrix(CAM)- Artificial Intelligence – P20MCSE141

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Course Title: Probability & Statistics

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Course Learning Objectives (CLO’s)

The course P20MCSE142 aims to:
1. Learn the basic concepts of probability and its applications.
2. Identify the different types of distributions.
3. Learn the fundamentals of stochastic process.
4. Analyze the probabilistic analysis of algorithms.
5. Understand the fundamentals of statistical inference and regression.

Course Content

Unit-1

Introduction - combinatorial problems, conditional probability, Bayes’ rule, Bernoulli trials.


Self-Study Component: Probability axioms.

10 Hours

Unit -2

Continuous Random variables - The exponential distribution, Some important distributions – Normal or Gaussian Distribution, Functions of a random variable Jointly distributed Random variables Expectation-, Expectation of functions of more than one random variable Transform methods, Moments and Transforms of Some important Distributions. Computation of mean time failure, Inequalities and limit theorems.

Self-Study Component: Moments.

11 Hours

Unit-3


Self-Study Component: Random Incidence.

10 Hours

Unit-4


Self-Study Component: Non-Product-Form Networks.

11 Hours

Unit-5

Statistical inference - Introduction, Parameter estimation, Hypothesis testing.

Regression, correlation and analysis of variance - Least squares curve fitting, the coefficient of determination confidence interval in linear regression, correlation analysis Simple nonlinear regression, Higher dimensional least squares fit, analysis of variance.

Self-Study Component: Higher dimensional least squares fit, analysis of variance.

10 Hours
Course Outcome:
On successful completion of the course the students will be able to
1. Discuss the fundamental concepts of probability and its applications.
2. Identify the different types of distributions with their applications.
3. Solve the practical stochastic modeling problems.
4. Identify and analyse the probabilistic analysis of algorithms.
5. Learn to solve the problems of statistical inference and regression.

Textbook/ Textbooks

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<td>1</td>
<td>Probability and Statistics with Reliability, Queueing and Computer Science Applications.</td>
<td>K.S. Trivedi</td>
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<td>1</td>
<td>Probability and statistics for Engineers and Scientists</td>
<td>Walpole,myers,Myers</td>
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Course Articulation Matrix(CAM) Probability & Statistics - P20MCSE142

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Course Title: Natural Language Processing  
Course Code: P20MCSE151  
Sem: I  
L-T-P-H: 4:0:0:4  
Credits - 4  
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs  
Weightage: CIE:50; SEE:50

Course Learning Objectives (CLO’s)
The course P20MCSE151 aims to:
This subject aims to achieve the following goals:

1. To introduce students the challenges of empirical methods for natural language processing (NLP) applications.
2. To introduce basic mathematical models and methods used in NLP applications to formulate computational solutions.
3. To provide students with the knowledge on designing procedures for natural language resource annotation and the use of related tools for text analysis and hands-on experience of using such tools.
4. To introduce students research and development work in information retrieval, information extraction, and knowledge discovery using different natural language resources.
5. To give students opportunities to sharpen their programming skills for computational linguistics applications.

Course Content

<table>
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<tr>
<th>Unit</th>
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<tbody>
<tr>
<td>Unit-1</td>
<td>Introduction to NLP: Definition, Knowledge in speech and language processing, Word Classes: Review of Regular Expressions, Morphology: Inflectional, derivational, parsing and parsing with FST, Combining FST lexicon and rules. Self-Study Component: Human morphological processing. 10 Hours</td>
</tr>
<tr>
<td>Unit-2</td>
<td>Phonology: Speech sounds, phonetic transcription, phoneme and phonological rules, optimality theory, machine learning of phonological rules, phonological aspects of prosody and speech synthesis. Pronunciation, Spelling and N-grams: Spelling errors, detection and elimination using probabilistic models, pronunciation variation (lexical, allophonic, dialect), decision tree model, counting words in Corpora, simple N-grams, smoothing (Add One, Written-Bell, Good-Turing). Self-Study Component: N-grams for spelling and pronunciation. 11 Hours</td>
</tr>
<tr>
<td>Unit-3</td>
<td>POS Tagging: Tag sets, concept of HMM tagger, rule based and stochastic POST, algorithm for HMM tagging, transformation based tagging, Sentence level construction &amp; unification: Noun phrase, co-ordination, sub-categorization. Self-Study Component: Concept of feature structure and unification. 10 Hours</td>
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<tr>
<td>Unit-4</td>
<td>Lexical Semantics and Word Sense Disambiguation: Semantics: Representing Meaning: Unambiguous representation, canonical form, expressiveness, meaning structure of language, basics of FOPC, semantics of FIPC. Semantic Analysis: Syntax driven, attachment &amp; integration, robustness. Lexemes (homonymy, polysemy, synonymy, hyponymy), WordNet, internal structure of words, creativity and the</td>
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</table>

**Self-Study Component:** Dictionary based approaches.

**11 Hours**

**Unit-5**

**Pragmatics:**

**Self-Study Component:** Text schemata, rhetorical relations.

**10 Hours**

**Course outcomes:**
At the end of the course the student will be capable of:
1. Understanding of the fundamental mathematical models and algorithms in the field of NLP.
2. Apply these mathematical models and algorithms in applications in software design and implementation for NLP.
3. Understanding the principles of language resource annotation and its use in machine learning applications and apply the above principles in analysis of data and acquire intended information through the use of available tools.
4. Understanding the design and implementation issues in various NLP applications such as information retrieval and information extraction.
5. Understanding the complexity of Natural Language Generation.

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**Reference Books**

1. *Natural Language Processing* A Pananian Perspective  
   Barry Nance  
   Prentice Hall  
   Eastern Economy Edition. Eugene Cherniak

2. *Natural Language Understanding.*  
   Allen, James.  
   Benjamin/ Cummings  

**Course Articulation Matrix(CAM) - Natural Language Processing – P20MCSE151**

<table>
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The course P20MCSE152 aims to:
The course aims to gain knowledge on:

1. Information Security, Attacks, Legal and Ethical Issues.
2. Information Security Planning and Strategies.
4. Hand Held Devices, Tools and Methods used in Cyber Crime
5. Organizational Implications and Forensics

Course Content

Unit -1

Self-Study Component: Legal ethical and professional Issues in information security.

10 Hours

Unit-2

Self-Study Component: Security policy standards and practices.

10 Hours

Unit-3
Cyber Security:
CYBERCRIME: Introduction, Cybercrime definition and origins of the word, Cybercrime and information security, who are Cybercriminals, Classifications of cybercrimes, Cybercrime: The legal perspectives, Cybercrimes: An Indian perspective, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes.

CYBEROFFENSES:
Introduction, How criminal plan the attacks, Social Engineering, Cyber stalking, Cybercafé and Cybercrimes, the Fuel for Cybercrime.

Self-Study Component: Attack vector, Cloud computing.

11 Hours

Unit-4
CYBERCRIME: MOBILE AND WIRELESS DEVICES

TOOLS AND METHODS USED IN CYBERCRIME
Introduction, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks,
**Self-Study Component:** Proxy Servers and Anonymizers.

**11 Hours**

**UNIT 5**

**COMPUTER FORENSICS**


**ORGANIZATIONAL IMPLICATIONS**


**Self-Study Component:** Relevance of the OSI 7 Layer Model to the Computer Forensics and Social Networking.

**10 Hours**

**Course outcomes:**

2. Analyze Information security challenges, mobile devices and information systems access in the cybercrime world and Use tools and methods used in cybercrime.
3. Describe and Analyze Cyber Crime and Offences, Demonstrate phishing, identity theft and Illustrate the challenges faced in punishing the cybercriminals.
4. Summarize the fundamental concepts in cyber forensics.
5. Implement tools used for the forensics of hand-held devices and Develop data privacy and security best practices essential for organizations.

<table>
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<tr>
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<tr>
<td>2</td>
<td>Nina Godbole, Sunit Belapure,</td>
<td>Cyber Security</td>
<td>Wiley India,</td>
<td>2014.</td>
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**Course Articulation Matrix(CAM)- Information & Cyber Security – P20MCSE152**

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</table>
Course Learning Objectives (CLO’s)

The course P20MCSEL16 aims to:

1. Apply the algorithms and design techniques to solve problems.
2. Prove the correctness of the running time of the algorithms in various domains.
3. Model real problems using the language of graphs and flows.
4. To implement various designing paradigms of algorithms for solving problems in different domains.

Design, develop and execute the following algorithms and determine their performance.

1. Implement Euclidean Nearest Neighbor Searching algorithm.
2. Implement algorithm to merges two Voronoi diagrams into one Voronoi diagram
3. Implement an algorithm to construct a convex hull based on the divide-and-conquer strategy.
4. Write a program to solve the 2-dimensional closest pair problem using divide-and-conquer method.
5. Write a program to find a Hamiltonian cycle using tree searching technique (graph should have minimum of 6 nodes).
6. Implement algorithm to find the shortest path between the given two nodes by the branch-and-bound strategy.
8. Implement prune-and-search algorithm to find the kth smallest element.
10. Implement longest common subsequence problem.
11. Implement RNA maximum base pair matching algorithm.
12. Implement an approximation algorithm for the node cover problem.

Course Outcome

1. Compare the performance of different algorithms for the same problem.
2. Solve problems by reducing to other problems whose solution is known and show that problems are hard by reducing from other problems.
3. Make intelligent decisions about alternative data structures and algorithmic techniques in the context of software problems, choosing from existing data structures and algorithms or design own when necessary.
4. Develop the efficient algorithms for the problem with suitable techniques.
Course Title: Data Science

Course Code: P20MCSE21   Sem: II   L-T-P-H: 4:0:0:4   Credits - 4
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs  Weightage: CIE:50; SEE:50

Course Learning Objectives (CLO’s)

The course P20MCSE21 aims to:
1. Explain Big Data and Data Science, Statistical modeling, probability distributions, fitting a model
2. Explain Exploratory Data Analysis and the Data Science Process, Three Basic Machine Learning Algorithms
3. Focuses on the Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes.
4. Expose Feature Generation and Feature Selection
5. Visualize the data and follow of ethics

Course Content

Unit -1

Self-Study Component: Statistical modeling using R.

10 Hours

Unit-2
Exploratory Data Analysis and the Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: Real Direct (online real estate firm). Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbors (k-NN), k-means

Self-Study Component: Logistic Regression and Apriori.

10 Hours

Unit-3
More Machine Learning Algorithm and Usage in Applications: Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web

Self-Study Component: CNN

10 Hours

Unit-4

Self-Study Component: Vectorisation

10 Hours

Unit-5
Self-Study Component: Data visualisation using Tensorflow

Course outcomes:
1. Define data science and its fundamentals
2. Demonstrate the process in data science
3. Explain machine learning algorithms necessary for data sciences
4. Illustrate the process of feature selection and analysis of data analysis algorithms
5. Visualize the data and follow of ethics

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<thead>
<tr>
<th>Sl. No.</th>
<th>Title of the book</th>
<th>Name of the Author/s</th>
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<th>Edition and year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Doing Data Science, Straight Talk From The Frontline</td>
<td>Cathy O’Neil and Rachel Schutt</td>
<td>O’Reilly</td>
<td>2014</td>
</tr>
</tbody>
</table>

Reference Books
1. Mining of Massive Datasets, v2.1
   Jure Leskovek, Anand Rajaraman and Jeffrey Ullman
   Cambridge University Press
   2014
2. Machine Learning: A Probabilistic Perspective
   Kevin P. Murphy
   2013
   Jiawei Han, Micheline Kamber and Jian Pei
   Third Edition
   2012.

Course Articulation Matrix (CAM) - Data Science – P20MCSE21

<table>
<thead>
<tr>
<th>Course Outcomes (CO’s)</th>
<th>Program Outcomes (PO’s)</th>
<th>PSO’s</th>
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</table>
Course Learning Objectives (CLO’s)

The course P20MCSE22 aims to:
1. Analyze technologies of multicore architecture and performance measures
2. Demonstrate problems related to multiprocessing
3. Illustrate windows threading, posix threads, openmp programming.
4. Analyze the common problems in parallel programming

Course Content

Unit -1
Self-Study Component: Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.
11 Hours

Unit-2
11 Hours

Unit-3
Threading APIs: Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads,
Self-Study Component: Thread Synchronization, Signaling, Compilation and Linking.
11 Hours

Unit-4
OpenMP: A Portable Solution for Threading : Challenges in Threading a Loop, Loopcarried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions,
Self-Study Component: OpenMP Environment Variables, Compilation, Debugging, performance
10 Hours
Unit-5


10 Hours

Course outcomes:
1. Analyze the salient features of different multicore architectures and the exploitation parallelism.
2. Define fundamental concepts of parallel programming and its design issues.
3. Compare the different threading API’s.
4. Demonstrate the role of OpenMP and programming concept.
5. Explain the concepts of deadlocks, data races & Design a Nonblocking Algorithms

Textbook/ Textbooks

<table>
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<tr>
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<tr>
<td>1</td>
<td>Multicore Programming, Increased Performance through Software Multi-threading</td>
<td>Shameem Akhter and Jason Roberts</td>
<td>Intel Press</td>
<td>2006</td>
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</table>

Course Articulation Matrix(CAM) - Multicore Architecture & Programming – P20MCSE22

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Practical Components

OPENMP PROGRAMS

1. Write an OpenMP program which performs C=A+B& D=A-B in separate blocks/sections where A,B,C & D are arrays.
2. Write an OpenMP program to add all the elements of two arrays A & B each of size 1000 and store their sum in a variable using reduction clause.
3. Write an OpenMP program to multiply two matrices A & B and find the resultant matrix C.
4. Write an OpenMP program to find the number of processes, number of threads, etc (the environment information).
5. Write an OpenMP program to find the largest element in an array using critical section.
6. Write an OpenMP program to find the sum of an array A and store the result in a variable.
7. Write an OpenMP program to print all the letters of the alphabet A- Z using threads.
8. Write an OpenMP program to show how thread private clause works.
Prerequisite:
Expertise in Programming, Basic Knowledge of Computer Security, Cryptography, Networking, Concurrent or Parallel Programming.

Course Learning Objectives:
1. Be able to explain what is blockchain
2. Be able to explain why we need blockchain? What is the real world problems that blockchain is trying to solve?
3. Understand and describe how blockchain works
4. Explain the underlying technology of transactions, blocks, proof-of-work, and consensus building
5. How does blockchain exist in the public domain (decentralized, distributed) yet maintain transparency, privacy, anonymity, security, immutability, history
6. How is blockchain incentivized without any central controlling or trusted agency
7. How Bitcoin crypto currency works
8. Why people value a ‘digital’ currency, how it can be protected against scam, fraud, hacking and devaluation
9. Design and implement new ways of using blockchain for applications other than crypto currency
10. Explore platforms such as Ethereum to build applications on blockchain

Course Content

Unit: 1

Introduction to Block chain: Backstory of Block chain, what is Block chain? Centralized vs. Decentralized Systems, Layers of Block chain, why is Blockchain Important? Limitations of Centralized Systems, Blockchain Adoption So Far, Blockchain Uses and Use Cases How Blockchain Works-1: Laying the Blockchain Foundation, Cryptography, Symmetric Key Cryptography, Cryptographic Hash Functions.

Self Study: MAC and HMAC 10 Hours

Unit-2


Self Study: Game Theory 10 Hours
Unit 3


**Self Study:** Putting it All Together  

10 Hours

Unit 4


**Self Study:** Ethereum Ecosystem  

10 Hours

Unit 5


**Self Study:** Public Nodes vs. Self-Hosted Nodes, Decentralized Applications and Servers  

12 Hours

**Text Book:**


**Reference Books:**


3. https://www.coursera.org/specializations/introduction-to-blockchain
4. https://nptel.ac.in/courses/106/104/106104220/

Course Outcome's

1. Understand the structure of a blockchain and why/when it is better than a simple distributed database
2. Explain the significance of cryptographic algorithms in blockchain
3. Describe the features and importance of Bitcoin
4. Explain about the principles of Ethereum Virtual Machine
5. Design, build, and deploy smart contracts and distributed applications,

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<th>Course Articulation Matrix(CAM) - Block Chain Technologies – P20MCSE23</th>
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Course Title: Deep Learning

Course Code: P20MCSE241  |  Sem: II  |  L-T-P-H: 4:0:4  |  Credits - 4
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs  |  Weightage: CIE:50; SEE:50

Course Learning Objectives (CLO’s)

The course P20MCSE241 aims to:
1. Student need to understand the concept of Deep Learning.
2. Student need to analyze Deep Networks
3. Student need to implement optimization of Deep Learning models
4. Student need to compare the Sequences of Deep Learning
5. Student Need to understand Practical importance of deep learning in social life

Course Content

Unit -1

10 Hours

Unit – 2

11 Hours

Unit – 3

11 Hours

Unit – 4

10 Hours

Unit – 5

10 Hours
Course Outcomes:
1. Understand the Basics of Machine Learning Concept.
2. Apply approaches on data classification.
3. Analyze the training modules.
4. Evaluate sequence Modeling.
5. Generate Practical Methodology

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<tbody>
<tr>
<td>1</td>
<td>Deep Learning</td>
<td>Lan Good fellow, Yoshua Bengio and Aaron Courville</td>
<td>MIT Press,</td>
<td>2016</td>
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</table>

Reference Books
1. Neural Networks: Asystematic Introduction
   - Author: Raúl Rojas
   - Publisher: Mit press

Course Articulation Matrix(CAM) - Deep Learning – P20MCSE241

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</table>
Course Title: Business Intelligence & its Application

Course Code: P20MCSE242  
Sem: II  
L-T-P-H: 4:0:4  
Credits - 4

Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs  
Weightage: CIE:50; SEE:50

Course Learning Objectives (CLO’s)

The course P20MCSE242 aims to:

1. To make students exposed with the basic rudiments of business intelligence system.
2. To provide knowledge about modeling aspects behind Business Intelligence
3. To provide knowledge about the business intelligence life cycle and the techniques used in it.
4. To make students be exposed with multidimensional data modeling techniques.
5. To provide knowledge about applying business intelligence methods to various situations.

Course Content

Unit -1


Introduction to OLTP and OLAP:
On-Line Transaction Processing (OLTP) and On-Line Analytical Processing (OLAP): Different, OLAP architectures, OLTP and OLAP, Data models for OLTP and OLAP, Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics.

Self-Study Component: OLTP and OLAP for a Nationalized Banking system.

12 Hours

Unit – 2

Getting started with business intelligence: Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, Popular BI tools.

Self-Study Component: Contribution of business intelligence in the growth of Nationalized Banking system.

10 Hours

Unit – 3

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart, OSS, Raiphe Kimball’s approach vs. W.H.Inmon’s approach, Goals of a data warehouse, Constituents of a data warehouse, Extract, transform, load, Data Integration, Data integration technologies, Data quality, Data profiling.

Self-Study Component: Construct a data warehouse for a company and apply ETL techniques.

10 Hours

Unit – 4

Multidimensional data modeling: Introduction, Data modeling basis, Types of data model, Data modeling techniques, Fact table, Dimension table, typical dimensional models,
Dimensional modeling life-cycle, designing the dimensional model, Step-by-step lab guide to analyze data using MS Excel 2010

**Measures, metrics, KPIs, and Performance management:** Understanding measures and performance, Measurement system terminology, Navigating a business enterprise, role of metrics, and metrics supply chain, “Fact-Based Decision Making” and KPIs

**Self-Study Component:** Construct a KPI for a company.

**10 Hours**

**Unit – 5**

KPI Usage in companies, business metrics and KPIs, Connecting the dots: Measures to business decisions and beyond

**Basics of enterprise reporting:** Reporting perspectives common to all levels enterprise, Report standardization and presentation practices, Enterprise reporting characteristics in OLAP world, Balanced scorecard, Dash boards and its creation, Scorecards vs. Dashboards, The buzz behind analysis, Step-by-step lab guide to create enterprise reports using MS Acess.

**Self-Study Component:** Construct balanced scorecard and dashboard for a company.

**10 Hours**

**Course Outcomes:**

1. **Illustrate** role of business intelligence in the IT applications.
2. **Construct** OLAP operations to analyze business intelligence.
3. **Apply** various ETL techniques of data integration.
4. **Identify** data modeling technique to analyze data for a successful business enterprise.
5. **Construct** enterprise reports for various situations of a business enterprise.

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<thead>
<tr>
<th>Textbook/ Textbooks</th>
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<tbody>
<tr>
<td><strong>Sl. No.</strong></td>
<td><strong>Title of the book</strong></td>
</tr>
<tr>
<td>1</td>
<td>Fundamentals of Business Analytics”, Publishers:</td>
</tr>
<tr>
<td>2</td>
<td>Business Intelligence: The Savvy Manager's Guide</td>
</tr>
</tbody>
</table>

**Reference Books**

|  |
|---------------------|---|
| 1 | Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications | Larissa T Moss and Shaku Atre | Addison Wesley Information Technology Series |

**Textbook/ Textbooks**

**Tutorials** : Keeping in mind your college and its operations as a business, identify the core business processes and explain the different levels of users and their roles.

**Practical Exposure:** Students are expected to practice relevant lab exercises to get exposure to BI concepts and tool. With this objective, students should take up the following projects by the time of completion of the course:

Project 1: A project that allows the students to apply Technical, Behavioral, Process concepts learnt in the course by:
- Executing near real-life project (with large data)
- Working in teams (project teams will ideally comprise of 4 members)
- Experiencing expectations from different roles
Project 2: Data in disparate data sources such as Excel, text file, databases etc. will be provided to the students. They will be expected to extract, cleanse, integrate and load it into the data-warehouse.

Project 3: Design reports according to given business scenarios. The data for the reports is to be pulled from the data-warehouse built in the earlier project.

Integrated Project: Extract data from various data sources, perform transformations, load into target database/spreadsheet, create a cube and pull reports on the data.

Software Requirements

Software required for Tutorials and Practical:

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<td>1.</td>
<td>Business Intelligence (BI) and its application</td>
<td>Kettle – open source</td>
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<td>MS Office – MS Access + MS Excel</td>
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Course Articulation Matrix(CAM) - Business Intelligence & its Application – P20MCSE242

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</table>
Course Learning Objectives (CLO’s)

The course P20MCSE251 aims to:

1. To understand the basic concepts of Agile Software Process.
2. To gain knowledge in the area of various Agile Methodologies.
3. To develop Agile Software Process.
4. To know the principles of Agile Testing.
5. Assess product quality risks within an Agile project.

Course Content

Unit - 1

INTRODUCTION
Software is new product development – Iterative development – Risk (Driven and Client Driven iterative planning – During the Iteration, No changes from external stakeholders – Evolutionary and adaptive Development (Evolutionary requirements analysis – Early “Top Ten” high (level requirements and skilful analysis Evolutionary and adaptive planning – Incremental delivery – Evolutionary delivery – The most common mistake – Specific iterative and Evolutionary methods.

Self-Study Component: Time boxed iterative development

12 Hours

Unit – 2

AGILE AND ITS SIGNIFICANCE

Self-Study Component: Simple practices of Agile Methods and project tools

10 Hours

Unit – 3


Self-Study Component: Common mistakes and misunderstandings.

10 Hours

Unit – 4

SCRUM

Self-Study Component: Unified process.

10 Hours
Unit – 5
AGILE PRACTICING AND TESTING

Self-Study Component: Agile Testing Principles

10 Hours

Course outcomes:
1. Demonstrate a systematic understanding of current agile techniques and practices used in industry.
2. Apply industry standard agile techniques in developing software in a team.
3. Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context.
4. Apply concepts of XP and EVE in developing software.
5. Managing changes applying different testing techniques

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<tbody>
<tr>
<td>1</td>
<td>“Agile and Iterative Development – A Manager’s Guide”</td>
<td>Craig Larman</td>
<td>Pearson Education</td>
<td>2004</td>
</tr>
<tr>
<td>2</td>
<td>“Agile Testing”</td>
<td>Elisabeth Hendrickson</td>
<td>Quality Tree Software Inc</td>
<td>2008</td>
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Reference Books

Course Articulation Matrix(CAM) - Agile Technologies – P20MCSE251

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</table>
Course Title: Network Management System

Course Code: P20MCSE252  Sem: II  L-T-P-H: 4:0:0:4  Credits - 4
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs  Weightage: CIE:50; SEE:50

Course Learning Objectives (CLO’s)

The course P20MCSE252 aims to:

1. Illustrate the need for interoperable network management.
2. Explain the concepts and architecture behind standards based network management.
3. Differentiate the concepts and terminology associated with SNMP and TMN.
4. Explain Use RMON for monitoring the behavior of the network.
5. Describe network management as a typical distributed application.

Course Content

Unit -1

Self-Study Component: Case Histories of Networking and Management – The Importance of topology, Filtering Does Not Reduce Load on Node, Some Common Network Problems;

11 Hours

Unit – 2

Self-Study Component: Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.

11 Hours

Unit – 3

Self-Study Component: RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications.

10 Hours
Unit – 4

Self-Study Component: SNMP-Based ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2, ADSL Configuration Profiles, TR-069 concepts.

10 Hours

Unit – 5


10 Hours

Course outcomes:
At the end of the course the student will be able to:

1. Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
2. Apply network management standards to manage practical networks.
3. Use on SNMP for managing the network.
4. Use RMON for monitoring the behavior of the network.
5. Identify the various components of network and formulate the scheme for the managing them.

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Reference Books
1. Network management Concepts and Practices
   J. Richard Burke
   PHI
   2008

Course Articulation Matrix(CAM) - Network Management System – P20MCSE252

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Course Title: Data Science Lab

Course Code: P20MCSEL27  |  Sem: II  |  L-T-P-H: 0:0:4:4  |  Credits - 2
Contact Period: Lab: 04 hrs/week  |  Exam: 3 Hrs  |  Weightage: CIE:50; SEE:50

Course Learning Objectives (CLO’s)
The course P20MCSEL27 aims to:
1. Apply the algorithms and design techniques to solve problems.
2. Prove the correctness of the running time of the algorithms.
3. Model real problems using the language of graphs and flows.
4. To implement various designing paradigms of algorithms for solving problems in different domains.

Design, develop and execute the following algorithms and determine their performance
1. Implementation of AND/OR/NOT Gates using single layer perception
2. Implementation of XOR Gate using multi-layers perceptron/error back propagation
3. Understanding the concept of perceptron learning rule
4. Understanding the concept of hebbiann learning rule
5. Understanding the concept of correlation learning rule
6. Understanding the functioning of fuzzication process
7. Implement and demonstrate FIND S Algorithm
8. Implement and demonstrate Candidate-Elimination algorithm.
9. Program to demonstrate the working of the decision tree based ID3 algorithm.
10. Implement and demonstrate the Back propagation algorithm TO CONSTRUCT an Artificial Neural Network
11. Implement the naïve Bayesian classifier and compute the accuracy of the classifier.
12. Implement k-Nearest Neighbour algorithm to classify the iris data set.
13. Implement the non-parametric Locally Weighted Regression algorithm
14. Implement and demonstrate the Random forest algorithm
15. Implement and demonstrate k-means algorithm

Course Outcome
1. Compare the performance of different algorithms for the same problem.
2. Solve problems by reducing to other problems whose solution is known and show that problems are hard by reducing from other problems.
3. Make intelligent decisions about alternative algorithmic techniques in the context of software problems, choosing from existing algorithms or design own when necessary.
4. Develop the efficient algorithms for the problem with suitable techniques.

Ref: Virtual Labs an MHRD Govt of India initiative, IIT Bombay
Course Title: Research Methodology and IPR

<table>
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<tr>
<th>Course Code: P20MCSE31</th>
<th>Sem: III</th>
<th>L-T-P-H: 4:0:0:4</th>
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<td>Exam: 3 Hrs</td>
<td>Weightage: CIE:50; SEE:50</td>
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Course Content

Unit -1

Unit – 2

Unit – 3

Unit – 4

Unit – 5

Course outcomes:
1. Discuss research methodology and the technique of defining a research problem
2. Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
3. Explain various research designs, sampling designs, measurement and scaling techniques and also different methods of data collections.
4. Explain several parametric tests of hypotheses, Chi-square test, art of interpretation and writing research reports
5. Discuss various forms of the intellectual property, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Title of the book</th>
<th>Name of the Author/s</th>
<th>Publisher Name</th>
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<tr>
<td>3</td>
<td>Study Material (For the topic Intellectual Property under module 5 )</td>
<td>Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament,</td>
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Reference Books
2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications 2009